OPEC at High Noon 1974-1981

by

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Full many a glorious morning have I seen...
Gilding the streams with heavenly alchemy
Anon permit the basest clouds to ride
With ugly wrack on his celestial face.

"Those who could [cheat], did.
Those who couldn't, complained."
--Sheikh Ali al-Khalifa al-Sabah
(Oil Minister, Kuwait)

When you have a friend, tried and true,
Do him quick, before he does you.
--Maxims of James McPherson
(Boatswain, US Navy)

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ABSTRACT

After 1973, oil consumption stagnated worldwide. Non-OPEC output increased, mostly in Alaska, Mexico, and the North Sea, but not because of the price rise.

The cartel nations had to assume the whole burden of cutting back output to maintain price. The demand for OPEC oil, the difference between total demand and non-OPEC supply, declined accordingly. From early 1974, current producing capacity much exceeded current output.

The oil companies were expropriated from production. They were no longer a buffer between the OPEC nations and the market, and no longer equated the amount of crude supplied with the amount demanded.

Thus it was more difficult for the cartel nations to cope with their two objectives: (1) A price and total cartel output to keep or improve total cartel revenues. (2) A division of the market acceptable to the members, at least for the time being. Each objective is difficult, both together much more so. All solutions are temporary. What is right today is wrong tomorrow. The optimal price/output combination may change, or its perception may change. Members may cheat, or the burden of restriction may become intolerably great for one or more sellers.

Despite shrinking demand and the loss of the oil companies as agents, the OPEC nations raised the price through 1974, and raised it more moderately through 1978. There was much dissention, which never broke unity.

More price increases were expected in 1978. The demand for oil was misperceived as almost completely unresponsive to price. OPEC decision-making was further biased by the OPEC nations' chronic financial problems as their spending rose even faster than their revenues. By 1978, Saudi Arabia was in budget and current-account deficit.

The Iranian Revolution led to a temporary loss of all Iranian supply, and a permanent loss of some. There was little if any shortfall in production, and beyond production there was enough excess capacity to have maintained output without price increases. But two output cuts by Saudi Arabia, and refusal to indicate when they would be restored, generated waves of precautionary and then speculative demand which made spot prices explode.

Official or contract prices were ratcheted up to make the increases permanent, roughly from 12.50 to $34 in 1981. We are compelled to go past this date in describing the upward movement because of the general market disarray. One cannot date with precision when it became apparent that the OPEC nations had raised the price too far for their own good. But there was no willingness to retreat on price, and the line was held for the time being.

INTRODUCTION

During the period between the two oil price explosions, it was widely accepted in the consuming countries that OPEC was a surface phenomenon. Higher prices were inevitable. OPEC was not a true cartel anyway, since they did not fix and allocate production quotas. Prices even after the first explosion were believed to be actually lower than they would be if the producing nations simply followed their own preference, to keep the oil in the ground for future generations; its value appreciated faster than "money in the bank." To keep them producing "enough for our needs" required good political relations.

The failure of demand to collapse overnight, and for non-OPEC output to soar, seemed to verify such theories. They ruled in Washington, and justified "cooperation not confrontation." (It was never explained what "confrontation" meant.) We will never know whether a more wary and skeptical attitude in the consuming countries would have made the OPEC nations act more cautiously.

In this paper, we first review quickly the basic elements of cartel theory, then trace out the changes with which OPEC members had to cope: in supply, demand, and control and management of their oil assets. These all made their task more difficult, but during 1974-1978 they were up to the challenge. The second part of the paper describes the situation on the eve of the second price explosion: supply/demand, member relations, and the encouragement given to OPEC, especially to the Saudis, by the Carter Administration. The third section deals with the price explosion of 1979-1981, and its immediate aftermath.

THE NATURE OF A CARTEL: COLLUSION AND CONFLICT

In a competitive industry, the price and the incremental cost gravitate to each other. Incremental cost includes a sufficient return to induce the incremental investment, and to offset the value of the inventory used up.[1] If the price is below cost, investment and output contract, lowering cost and raising price to bring them together again. Contrariwise, when price exceeds cost, investment becomes unusually profitable. If sellers act as individual wealth-maximizers, competition forces each one to expand output and lower prices. If one doesn't, another will.

Of course, sellers would rather not be coerced by an invisible hand into giving more and taking less. By acting in concert, i.e., as a monopoly, the group can earn higher profits by producing less and charging more. The higher price can only be maintained by restricting output. The drastic investment and output cutbacks in world oil after the price increases, especially by very low cost producers, would be impossible in a competitive industry, like water running uphill. It shows the strength of the cartel. The rule that a monopoly has no supply curve seems pedantic until it is seen as necessary to explain what is happening. [Cf. Adelman 1962, p. 38]

The dichotomy between "cartel prices" and "market prices" is false. All effective prices are market prices. If a cartel controls the market, it sets the market price. A group monopoly may fix output and let the force of demand fix the price at the desired level.

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[1] I have dealt elsewhere with the complexities of measuring this value, known variously as reproduction cost, resource rent, user cost, et. [Adelman 1991a, and references cited there.] Its consideration changes nothing in the analysis.

It is a "market-determined" price all right, and also a monopoly price. Or the group may fix prices directly. But unless they can control supply, the collusive price will collapse as each firm seeks its own advantage by expanding output.

Excess producing capacity has plagued most cartels. [Eckbo 1976] Each member has a motive for adding capacity, to sell more by discounting from the higher price, and to gain bargaining power for haggling over market shares with other members. The more the capacity, the greater the damage the member can inflict, and the more he is respected. Not only does added capacity cost money, which soon becomes scarce after the latest price boost and flush times, but each member puts himself under great pressure to shade prices just a little, to get very profitable incremental sales. The seller who loses sales may retaliate. If everyone does this, the price will slide far down.

Matters are even more complex when one of the members is disproportionately large. [Cf. Adelman 1978] To take a very simple example: let previous sales be 100 units, price $1, total revenues $100. Suppose the cartel consensus is that if the price were doubled, sales would decrease by only 20 percent. At a price of $2 for 80 units, the group would have $160 revenues, a clear gain of $60.

But suppose one large seller accounts for 40 percent of the market. This makes it easier to reach agreement. But at the higher price, he fears, the smaller members will cheat and offer small discounts. They will sell 60 units as before, for nearly twice as much. The large member is usually afraid to retaliate because that might wreck the whole cartel. If so, he would sell only the residual 20 units (80 less 60). His receipts would be unchanged at $40 ($2x20 units). Moreover, there is a risk that he will actually

be worse off. Therefore, he will not agree to a price increase from which he does not gain.[2]

In practice it is difficult to figure the effect of a price increase. [EMF 6, 1982] Differences of opinion are piled upon differences of interest. Hence reconciling the parties is even harder than in theory. But they will keep trying because the reward is there: in our example, from $100 to $160.

Thus every cartel embodies both collusion, to raise the price above competitive levels, and conflict over dividing the gains, even when it is plainly in everyone's interest to raise prices. Small sellers have an incentive to be price "hawks," and then to cheat, and let the large firm bear the burden of restricting output. The large firm has an incentive not to let the others cheat, and to be a price "dove" until it has some assurance of maintaining market share, for at least a short time. Both have a strong interest in patching up some kind of deal which will let them move all together toward higher revenues. Second-best or third-best, even for a limited time, is probably better than the status quo, and certainly much better than the ever-present threat of a slide into all-out competition.

The history of OPEC since 1973 is a recital of its members' attempts to practice collusion and abate conflict. The process is difficult or impossible to model because the basic variables are so poorly known: demand elasticity, productive capacity, and mutual

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[2] At the lower price level, demand elasticity is -0.322 for the group, -0.805 for the large firm. But at the doubled price, the large firm's elasticity would be -0.322/.25 = -1.288. The large seller would have gone too far; a lower price would be more profitable.

good faith, for starters. With past failures in mind, OPEC nations tried to avoid comprehensive market sharing agreements, but reserved these deals for a few strategic moments. The historical record shows successes and failures.

EXPROPRIATION OF THE OIL COMPANIES

Process The 1968 OPEC resolutions had made it clear that the nations would not be bound by agreements. The Tehran-Tripoli "agreements" of 1970-71 were hailed by the U.S. State Department: the "previously turbulent" oil market would now "calm down." [NYT 2-17-71:3] The five-year agreements lasted about five months. Mr. Kissinger later thought their violation broke all speed records. [Kissinger 1982, p.865] New conditions were unilaterally imposed in 1971 and 1972, and by August 1973 (two months before the outbreak of war), Iran and Saudi Arabia had decided to cancel them. [Adelman 1988][Adelman 1990]

During 1971-74, the "participation" demanded and granted went from 25 to 51 to 100 percent. Compensation was derisory: original cost of tangible assets, depreciated. For the oil companies, it was still worth bargaining over the amount of oil which they could lift, and the amount of their fee for discovery, development, and production. The process varied from country to country; it was described for Saudi Arabia, in the court testimony of Clifton Garvin, the CEO of Exxon [IRS: 1991], who was the chief Aramco negotiator:

> "[By 1974] "the things that had been signed in the '72 agreement were no longer being honored...[New arrangements] were reasonably well agreed to in the late summer of 1976...[but] never signed." [Tr. 87-88]
>
> "You were always aware that you were dealing with a sovereign entity...that could make these kinds of decisions, could change them at will. ... So, in essence, we never had a contract." [133]

[After 1976] we agreed to try to operate under the arrangements...[But] they didn't seem to survive very long. In other words, if it was in the interests of the Saudi government to change, they changed....We [also] tried to make the exploration arrangements work for awhile, but it became obvious in a very short period of time that they were not going to honor what those crude oil arrangements had anticipated, so that kind of fell from the wayside also. [162-164]

One sees the gradual increase of confidence that the sovereigns could do whatever they pleased, with no regard to "inky blots and rotten parchment bonds." A sovereign monopoly does not need to keep its promises. There is no law to enforce against it, and nowhere else to go.

The negotiations do shed some light on cost. Previously, Aramco had received 22 cents per barrel compensation or allowance. [PIW 7-14-75:1] We can adjust to 1968-1969 price levels by the IPAA factor price index (all components of drilling cost in the USA) in Table IV. Outside the United States, the inflation was probably greater because of local port congestion. At 1968-1969 prices, the cost would have been 22x(23/43), or 12 cents, close to our estimate of 10 cents. (Adelman 1972, Appendix II). Exxon Corporation [Exxon 1976], estimated Middle East "exploration and production" cost at 10 cents in 1970 and 25 cents in 1975. (This agrees with an Aramco estimate in [PIW 6-23-75:7] But 1976 cost was reckoned at 25 cents [PIW 3-27-77:11], and for 1978 about 32 cents. [PIW 7-3-78:8]) Middle East onshore wells were "in the 10 and 30 cents/barrel range." [PE 8-78:337]

Exploration worth one cent per barrel In March 1976, the Aramco terms again were "finally settled." The Aramco fee would be 15 cents for operating/technical service. Newly found oil would be paid for at 6 cents per barrel, as produced. [PIW 3-29-76:1] Depending on the interest rate, this had a present value of between one and two cents

per barrel.[3] [Adelman 1991a] At this time a North Sea reserve was sold at about $1.60 per undeveloped barrel in the ground. [PIW 3-15-76:2] It shows that the parties thought discovery in Saudi Arabia was easy and cheap, and also that new oil was worth very little because current reserves were overabundant and being depleted so slowly. The discovery cost/value was equal to what others call "user cost" or "resource rent." (See also the discussion of the monopoly goal at p. 31 below.) The negligible value of user cost again shows an extreme monopoly distortion.

In the meantime, negotiations in Iran also hinged on a 22 cent margin, originally "b ased on a production cost of about 12 or 13 cents a barrel, but the actual cost has now risen to 16 cents." [PIW 3-10-75:1] [Id. 5-5-75:1] Kuwait costs had been previously re ckoned at 7 cents per barrel, but had gradually risen to 15 cents. [PIW 9-13-76:8]

The old order As Mr. Garvin makes clear, it is impossible to put a precise date on the expropriation. By 1975/1976, instead of setting a firm price floor by fixing per-ba rrel taxes, and letting the companies compete freely above the floor, the governments had to fix prices directly. It was a change for the worse.

Before the divorce, the multinational oil companies had set the volume of their production equal to the amount they expected to sell. There was no collusion after World War II. Each company tried to sell all it could without changing the existing price. Because they could not collude, the price slid down by 80 percent after World

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[3] Explanation: the barrel would be produced at the Aramco depletion rate of 2 percent per year. Hence the first year's payment would be 6x.02 = 0.12 cent. The present value of the perpetual stream would be equal to .12/(.02+i), where i is the dis count rate. If the discount rate was .05, the present value was 1.7 cents; if .10, present value was 1.0 cent.

War II. But the decline took a generation, and even in mid-1970, the price was many times cost. It was a brilliant rear-guard operation. [Adelman 1972]

The companies could trust each other not to reduce prices unless compelled to do so by some fringe operator or government who could go below the floor. They also knew each others' investment and sales plans for several years ahead, because of the corpor ate interlocks. All four Aramco partners--Exxon, Mobil, Chevron, and Texaco--were a lso in the Iran Consortium. Exxon and Mobil were also partners in Iraq Petroleum C o., along with BP, Shell, and CFP. BP and Gulf (also in the Consortium) were co-owners of Kuwait Petroleum Co. Moreover, nearly all Venezuelan production was by Exxon, Shell, and Gulf. Finally, most Indonesian output was by Chevron, Texaco, Exxon and Mobil. Thus each of the large eight companies knew the investment plans and sales plans of all the others.

Before 1973, each OPEC government lobbied and pressured its resident companies to produce more, appealing to the companies' home governments, especially the United States. The legend that the OPEC nations wanted to produce less than did the compa nies belongs with the legend that before 1973 the companies deliberately held down the price. [Askari 1990, p. 28] [El Serafy, in Ahmad et al., 1989, p. 12] It takes some effort to believe that the multinational companies preferred less profit and more political da nger, both in host countries and in home countries, from local coal and oil producers.

Companies as buyers By 1976, the companies had become purchasers for their refining-marketing operations and so were fairly sensitive to small differences in crude oil prices. Refining/marketing profit margins were very low compared to the old

integrated margins, and differences of a few cents, which went straight to the bottom line, could make a company switch suppliers.

The new order OPEC governments now had to fix prices in concert, and to trust e ach other not to undermine those prices by trying too hard for additional sales. Alloc ating output was something they had tried in the 1960s, and had failed altogether. Wisely, they now avoided formal allocation, relying on inertia and general restraint to maintain existing market shares. But it was all too easy to offer something just a little better because of quality and location. Hence they always had to reconcile production plans, somehow. This meant squabbling at OPEC meetings, and a chronic tendency to add to the surplus.

SETTING PRICES IN THE NEW ORDER

Contract and spot prices Figure 4, (subdivided into 4a, 4b, and 4c) summarizes the oil market changes during 1973-1990. It contains at most four series, at times only two. Three of them are the Persian Gulf f.o.b. prices, as declared to the U.S. Government, of Saudi, Abu Dhabi, and Iranian crudes sold to American purchasers and delivered in the U.S. These are largely official contract prices, but including discounts and surcharges.

The fourth series is the monthly average spot price of Arab Light, the largest component of Saudi production. Spot prices are for single cargoes, each price set by day-to-day bargaining. The spot price is a valuable market indicator, because it captures and magnifies any momentary excess supply or demand. The whole force of excess supply or demand is focussed upon roughly 10 percent of the crude oil flow, thereby multiplying the price effect by much more than 10:1. An example will make this clear.

Suppose that the amount of oil demanded is one percent higher than the amount supplied, and short run demand elasticity is -0.1. Then if the whole market were ma de up of spot transactions, the price increase would be nearly 11 percent. But the 1 percent excess is all channeled into the spot market, of which it is 10 percent. If so, the spot price increase is 187 percent.[4]

Suppose that the sellers all immediately disregard official prices, and offer oil only at the current spot price. The spot price will settle at (or collapse to) about 11 percent above the old level. What can be done for a small segment cannot be done for the w hole flow, or even for a single large seller. Hence it is an illusion that the sellers are l osing out on huge increases by staying with the contract price. As the graph shows, even the Iranians could never get very close to spot, and overreached themselves thre e times in 1979. (There are no later prices because the hostage crisis ended sales to the USA in January 1980.)

Let the sellers now make the higher price official, and, simultaneously, let the transitory one-time excess disappear. Demand is back to where it was. By the old standards, the price is now 11 percent "too high." But <u>if</u> the sellers all hold fast to the higher official prices, <u>and</u> cut back production, offering only what can be sold at the higher price, the spot price will be firm, equal to the official price, until the next change.

Therefore, it is a mistake to regard spot prices as the "real market" prices, and offici

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[4] Let the ratio of later to earlier price be P, and let the ratio of later to earlier quantity be Q. Then $Q=P^E$, where E is the elasticity of demand. It follows that $P=Q^{1/E}$. Now let the quantity be reduced (a) by 1 percent, i.e., Q=0.99, or (b) by 10 percent, i.e., Q=0.90. Then the respective values of P are 1.11 and 2.87.

al prices as merely catching up with them. More particularly, it is wrong to take spot product prices as indicating what the traffic will bear, and official crude prices as mer ely derivative. As we saw in 1973-1974, and will see again in 1978-1980, (1) the antici pation of higher official crude oil prices (2) increases speculative demand, which (3) r aises the spot price, before (4) the official price changes. The spot price changes befor e the official price, but the anticipation is the cause of the spot price rise. Much econ ometric work has been wasted for want of attention to the old chestnut post hoc non propter hoc. [Samii Weiner & Wirl 1989] (See also [Wigel and Sandoval 1979] on ho w OPEC meetings promoted stockbuilding and speculative price increases.) The waste of time still continues, with spot prices used to "explain" official contract prices. [Okogu 1991][5]

The effect of expected price changes It was generally believed that OPEC would keep raising the price. What was first observed in 1973 now became systematic. Suppose an OPEC meeting is scheduled for December, and may raise the price, by 5 or 10 percent, on January 1. Then for anyone with unused storage, an investment in buying a barrel beforehand would earn the following:

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[5] The work of [Verleger 1982, p. 56] avoids this mistake, by recognizing that co ntrol of supply drives the system, through a highly complex inventory mechanism w hich we simply illustrate, without trying to measure.

Barrel bought on last day of:	June	July	Aug.	Sept.	Oct.	Nov.
Rate of return, pct/yr						
5 percent increase	10	12	16	22	34	80
10 percent increase	21	26	33	46	77	214

Of course, it was nowhere near so lush in practice. There might be an additional cost in leasing storage, and it was usually calculated. Forward buying, in excess of need, meant a carrying cost until the additional inventory was used up. There was also risk. The OPEC meeting might not raise the price.

But if the increase looked probable to some in the oil trade, including consumers, they would try to buy more crude oil and products. The increased demand would raise the spot price, months before the meeting. The OPEC meeting cite the spot price rise to justify raising official prices. They were merely "meeting the market."

Thus the expectation of higher prices fulfilled itself. But the higher price could only hold if the OPEC countries refrained from over-producing. This was particularly important right after the price increase, when the additional demand became a deficit.

The contract price increase is explained by Fadhil Al Chalabi, who was Permanent Under-Secretary of Oil in Iraq during 1973-1976, Assistant Secretary General of OAPEC in 1976-1978, then OPEC Deputy Secretary General. The price was fixed at end-December 1973 according to the monopoly criterion: equating to the supply price of alternative energy sources.

[T]he rationale behind the new price was not the market situation, as much as the decision to relate the government take to a level near the cost of available sources of energy.

An amount of $7 per barrel was thought to represent, at the then prevailing conditions, an indication of the cost of alternative sources of energy to oil...Accordingly the level of the new posted price was computed...so as to produce a net government take of that amount, $7 per barrel. [Al Chalabi 1980, p. 86-87]

The price increase continued in 1973, then more slowly in 1975-1978.

The role of inventories[6] In late 1978, total USA crude oil and products inventories held by the "primary" sector, i.e. oil companies in producing, refining, and distributing, were about 1300 million barrels. The range between minimum and maximum fill of the industry storage system was about 22 percent, or in round numbers nearly 300 million barrels. (This seems surprisingly small, but much apparent storage is pipeline fill and tank bottoms.)

There are no data on "downstream" inventories, outside the primary system. But some careful estimates were made in an unpublished doctoral thesis by Ellen Burton. [Burton 1982, especially Table 2-8 and pages 96-99.] Secondary distribution and consumer storage capacity was about 1100 million barrels in 1981, and it was on average not quite half full, i.e. about 500 million.

This could be a strong destabilizing influence. Assume that primary holders, expecting a price increase, try to increase stocks by 5 percent, and downstream holders, who have a much larger range of operating flexibility, by 10 percent. This would increase the amount demanded by 110 barrels, i.e. (1300x.05) + (500x.10) = 110. If the incremental

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[6] The following paragraphs are based on [Burton 1982]

buying is attempted over 60 days, the addition is 1.8 million barrels daily, over 11 percent of the total flow, which enters the USA system as crude oil and gradually becomes products. This increment goes mostly through spot channels.

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We now look to external developments: the consumption response and non-OPEC production.

STAGNANT CONSUMPTION 1974-1979

[FIGURE 1 HERE] NCW Consumption & OPEC Exports, 1967-1990

[TABLE I HERE] Non-Communist Consumption & OPEC Exports, 1973-1990

Worldwide (excluding the Centrally Planned Economies), the slowdown in oil consumption growth (ex-OPEC consumption) was drastic, from 7.5 percent per year in 1963-1973 to only 0.6 percent per year in 1973-1978. Gasoline and middle distillate use increased slowly, but fuel oil was stagnant, since much industrial and electric power demand could readily be switched. This pattern has continued through 1990; consumption of light ends has continued to grow, but at much lower than past rates. Fuel oil use has declined greatly.

[FIGURE 2 HERE] Oil Consumption & Real GDP

[TABLE II HERE] Oil Consumption & Real GDP

In part, stagnant demand was due to world economic recession and then very slow growth. There was also a response to the higher price level. The response is measured approximately by decline in oil consumption per unit of real Gross Domestic Product,

as seen in Figure 2.[7]

[FIGURE 3 HERE] Energy-Income Ratio Shifts

National income and oil (and other energy) use no longer expanded at about the same rate. There was much confusion about "uncoupling" income and energy use. In Figure 3, the previous relation is shown as the line R_0, and previous income and energy are shown at point (1). After the drastic price increase, the new relation is R_1. There is still a rigid one-to-one relation, and income elasticity of demand is still 1.0. If the reaction took place overnight, energy use would drop from position (1) to (2a). But the movement from the first relation to the second takes time. The speed of adjustment depends in part on the rate of economic growth. The faster the growth, the more investment is put in place which reflects the new higher price level, and conserves energy. Figure 3 shows a few of the infinite number of paths which might actually be traversed before the changeover from R_0 to R_1 is completed. Without being able to control for the causal factors, it is difficult to see where on what path an economy is at any given moment. But the movement was important, and generally missed.

A major report summed up official opinion at mid-decade [CIA 1977], but ignored price elasticity. They expected 1985 non-Communist demand of 70 mbd, and the call on OPEC oil at 49 mbd. The worldwide consensus was that energy, and especially oil, was scarce. To economize on it was a political, moral, almost a religious, duty. Energy savings were a proof of virtue, a public achievement.

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[7] The variations in the oil:GDP or energy:GDP ratio among nations do not measure the variation in energy efficiency unless one controls for variations in climate, industrial structure, population density, relative factor prices and consumer prices, etc.

All this noise hid the fact that oil and energy consumption respond not to preachment but to price. The response took the slow form of investment, which I once guessed had a half-life between 7 and 10 years. Hence the reduction in oil use per unit GNP, once underway, had to continue for years.[8]

Furthermore, as the price of a good rises, expenditures on the good become a larger part of the firm's or household's expenditure, increasing the buyer's sensitivity to further increases, hence the price elasticity. Perhaps, as purchasers shed the more easily substitutable uses, their remaining demands are less price-elastic. But the higher the price, the greater the reward to substitution. These measurement problems will never disappear.

[TABLE III HERE] Consumer Price and Crude Price 1972-1981

But the elasticity of crude oil demand was only a fraction of the elasticity of product demand. As Table III shows, in 1972 the Persian Gulf crude price was only 18 percent of the product price in Western Europe. Hence assuming a complete pass-through, a 5-fold increase in the crude price was only a 90 percent increase of the product price. (Some of the actual increase was due to a tax increase.) But in 1978-1981 a crude price increase of 157 percent required another doubling of product prices, and a second response, piled atop the developing response to the first shock.

But OPEC was only one part of crude oil supply, and when their market share decreased, the impact of a given price increase on their sales was amplified. Taking

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[8] But much of the price increase was canceled in later years. The unanswered question is: how reversible were the effects? As late as 1990, a decade after the oil price began to recede, the oil:GDP ratio was still creeping down.

these two effects together, the "elasticity factor" was about twice as great in 1978 as it had been in 1972. The product price elasticity had probably increased also.[9] This called for some caution by the sellers, which as we will see was absent. Well-informed opinion was that "price elasticity of demand approaches zero." [Yamani 1978]

NON-OPEC OUTPUT GROWTH: A PRICE RESPONSE?

[TABLE IV HERE] IPAA Index: Drilling Cost

Another unpleasant surprise was that output from non-OPEC producers rose from 17 mbd in 1973 to nearly 19 mbd in 1978. These producers were not cartelists but competitors, free to discount prices and to sell all they could produce. OPEC members would produce only what they could sell. To protect the price, they were forced to cut back production in favor of higher-cost producers. For low-cost producers to shrink, while high-cost producers expand is upside-down behavior, and a sign of monopoly restriction.

It is widely believed that higher oil prices drew in more investment, which increased output. This has even been incorporated into a cyclical model. [Petroleum Finance 1988] The muddy theory and irrelevant statistics are discussed elsewhere. [Adelman 1992] It is refuted by the upside-down behavior alone. Moreover, nearly all of the new supply of the 1970s was from fields not merely discovered but committed to development before the price explosion. They were profitable and would have come on stream at the

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[9] [Griffin 1992] has used a panel data set of 9 OECD countries to estimate oil product demand during 1955-1984. The short-run price elasticity is 0.226, the long-run coefficient is 1.04. Long run price elasticity of demand for gasoline, which tends to be the least price-elastic product, has been reckoned around unity. It seems also to have increased moderately over time. [Dahl & Sterner 1991]

pre-1973 levels of price and taxes.

Most of the new output came from three sources: the North Slope of Alaska, Mexico, and the North Sea.

Alaska North Slope The Prudhoe Bay field was discovered in 1968. By the end of 1971, 24 development wells had been drilled, but activity was slowing for lack of Congressional approval for a pipeline south across Alaska to the port of Valdez. [AAPG 1972, p. 1175] By the end of 1972, about 70 development wells had already been completed, but "only 1 rig is being operated pending approval of the pipeline". [AAPG 1973, p. 1408] Had approval come quickly, the field would have been fully developed by 1974.

Mexico For reasons discussed elsewhere [AHKZ 1983, ch. 9], the decision was taken in 1967 to embark on a new exploratory program in southeast Mexico. The first discoveries were made in 1972. They would have been profitable to develop under the 1972 price level.

Production per well per day is an inverse indicator of cost. In 1972, 58 Mexican fields produced at an average of 129 barrels daily per well. [OGJ:WWO 1972] Only two small fields produced more than one thousand barrels daily per well. The logarithmic unweighted mean was 4.8, and the standard deviation 1.2. This permits us to see where the new discoveries fit in. Presumably they would need to be above average to be profitable.

The 1972 annual report of Petroleos Mexicanos mentions discoveries, considered to be the biggest in the last 10 years, in a new area in southeast Mexico. The two new fields

were rated at more than 3500 barrels daily per well. [Pemex ML 1972, p. 2] In March 1973, the Director General of Pemex reported that the first three development wells were producing 3,420 barrels per well daily. Imports would be eliminated by the end of the year. [Pemex DG 1973, p. 13-14] Such wells were nearly three standard deviations above the 1972 mean. If we halve the flow, to allow for decline in later years, the new well at half-depletion is still 2.2 standard units above the mean, and higher than all but one field operating in 1972. As late as 1985, after years of depletion and underinvestment, few of the new Cretaceous fields (defined as Southern Zone, Comalcalco District, discovery year 1972 or later, depth 13,000 feet or deeper) produced at less than 1000 barrels daily per well, which is 1.8 standard deviations above the 1972 mean. [OGJ WWO 1985:88] All of them were worth developing at the old prices.

In 1976, discoveries began offshore. Nine years later, Cantarell field produced at 8500 barrels daily per well; the others at more than 10,000. (Ibid.) (Unfortunately, in 1986 Mexico joined the trend to suppress the publication of per-field production. This is symptomatic of the general deterioration of the data base in the last two decades.)

North Sea In late 1972, the value of a barrel of oil landed in the U.K. was projected at $3.37 in 1975-1976. [PE 11-72:421] Thus a barrel which was profitable at that price would be barely worth producing. Since our cost data are from later years, we need to adjust for the rapid rise in costs which followed soon after 1972. A special inquiry was made by the British DOE and Peat Marwick. From autumn 1973 to spring 1975 the cost of development in the North Sea increased by 140 percent. [PE 8-76:316] It is probably a considerable understatement to assume an increase of 200 percent from 1972 to

1977/1978. Thus the equivalent 1978 value in 1972 is understated at $10.11 per barrel ($3.32x3.0).

We need to calculate the investment per daily barrel which would be barely profitable at $10.11. We assume that a 30 percent rate of return (before tax) is needed, and that current operating costs will be about 5 percent per year. Then we can reckon, in 1978 dollars:

Break-even investment per daily barrel x .35/ 365 = $10.11

Break-even investment = $10,543 per daily barrel

[Adelman & Ward 1980] have calculated the needed 1978 investment per daily barrel by field, and the peak production per field, in the U. K. North Sea. The total peak production is 3,982 thousand bd, which is of course greater than maximum production in any one year. Of this amount, only 250 tbd (Ninian field) cost more than the break-even amount, and would not have been undertaken had not the price risen.

A good paradigm is in the Brent field, at $8727 per daily barrel. Not only is the cost overstated because it ignores the value of gas production, but events at the time suggested it could be produced before the price increase. Brent was discovered in May 1971. In August, the owners Shell and Esso "startled oil explorers" by making a very high bid on an adjoining tract. In August 1972, Shell issued a report (to quiet "exaggerated reports"), which said that Brent development was proceeding and the field would come on stream in 1975-1976. [PE 9-72:319] This was confirmed the next year. [PE 6-73:204]

Thus of the three important contributors, all of the North Slope and Mexico and about

94 percent of the UK North Sea would have been developed even at the old price levels.

USA There was a prompt investment response. Oil wells drilled rose from 10.2 thousand in 1973 to 20.7 thousand in 1979. Then in only two more years, they doubled again. Yet production decreased; reserves-added in the mid-1970s were the poorest in decades. Ultra-high prices seemed to induce ultra-low outputs. To some extent, this is to be expected. In the early stages of a frantic boom, the greater the inputs the less the output, because of hoarding of the factors: materials, machines, and manpower. Those with adequate supplies of one or two of the three factors hold them in the hope of getting the rest. Thereby, large amounts of the factors are for a time held idle or under-used. This probably explains why the absolute increase in USA well completions from 1979 to 1981 was twice as great as from 1973 to 1979: a sextupling of the annual rate. But the question still remains why the reserve additions per new oil well drilled, or per dollar spent, were so abysmally poor. We have tried to explain this elsewhere [Adelman 1992].

In any case, the conclusion stands: the 1973-1974 price increase contributed very little to additional supply for the remainder of the 1970s. Indeed, worldwide there may have been a net subtraction. In many countries, higher prices led to over-taxation and over-regulation, discouraging supply. There was also an increase in risk factors and therefore in minimum or "hurdle" rates of return in the Third World, because the expropriation of the oil companies showed that a concession or contract would not be honored.

[FIGURE 4 HERE] Non-OPEC, Non-Communist Output 1973-1991

As Figure 4 shows, total non-OPEC output declines mildly through 1976, then rises

steadily through 1982, a little more through 1985, then stagnates. It is neat enough: response to higher prices, then stagnation after 1985.

But a glance at the three main components shows this is mistaken. Output in the United States ex-Alaska kept declining steadily after 1973 through 1980, despite the two great price spikes. Then despite prices declining, output was steady to increasing through 1985. After the price crash, it resumed the decline of the early 1970s. There was no clear response to price changes.

Output in the three new areas of Alaska, Mexico, and the North Sea swept up quite dramatically through 1982, then slowed and was flat after 1985. But as already seen, the increase would have come about even without any price use. The decline in Mexico was not related to any resource constraint, but to egregious mismanagement and underinvestment.

The "other" group includes a large number of small producers, and is the best index of whatever underlying trend was at work. It increased mildly through 1980. Then as prices first declined then crashed, output nevertheless rose steadily. By 1990 the "all other" was distinctly the largest of the three components.

DEVELOPMENTS IN 1974-1978

The changes in supply and demand just summarized meant a weak market throughout the 1970s. This put OPEC's cohesion to the test, and provided an unplanned experiment of how the cartel operated in unpromising conditions.

[TABLE V HERE] OPEC Excess Capacity 1974

Matters were made more difficult by the appearance in 1974 of large scale excess

producing capacity. There had been almost none of it in earlier years. The occasional complaints of "surplus" referred to the underlying excess potential, which of course remained huge, or to a transitory excess caused by the fluctuations of demand or the need to bring on new supply in large increments which outran current demand.[10] Rapid consumption growth rapidly liquidated any such excess. The 1974 surplus was expected to disappear in the same way. Instead, investment already committed made capacity grow after 1973 even as sales declined or stagnated. Chronic excess capacity, which did not evaporate, was something new in world oil. (It had of course plagued the United States for the many years of market-demand-prorationing, administered by a cartel of states. [Adelman 1964]).

Operating under the new conditions: "sharing the losses" From the start, "the major discounters now are the national oil companies" [NYT 2-18-75:1], and those slow to react were losers. Libyan production fell from the 1970 peak of 3.3 mbd to 1.6 mbd in 1974. Their freight advantage disappeared because tanker rates fell.[11] The Libyans had failed to cut prices to reflect this. By the time they responded, and even offered lower taxes

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[10] To be sure, as Jack Hartshorn has pointed out, normal Aramco procedure (which was not unique) was to take forecasts from the four partners, then add 10 percent for operational and seasonal fluctuations, then another 10 percent for contingencies, a total 21 percent. This was in effect cheap insurance, since the only cost was the actual investment. Taxes were only on production and sale. But capacity needed for insurance is not capacity to be used for incremental sales. Otherwise one must suppose the absurdity of the Aramco companies building the capacity, being embarrassed by their own discounting on the basis of the capacity, and then investing afresh in more incremental capacity.

[11] To the U.S. State Department in 1970, the transitory freight advantage had been proof that Libya deserved to collect permanently higher taxes.

as an incentive for higher output [PE 7-75:242] OPEC exports were generally depressed, and they achieved only 2.1 mbd.

Abu Dhabi output fell by over a third from December 1974 to February 1975. After the usual oratory about wicked oil companies [NYT 3-3-75:41], they cut the premium for low-sulfur crude oil, and their March sales were back at the December level. The Saudis "have made themselves a shock absorber" by cutting output. [NYT 3-11-75:43] From October 1974 to April 1975, Saudi production fell from 8.8 to 5.8mbd. [PE 7-75:280]

> [By February 1975,] "an extraordinary degree of preoccupation with the levels of production and exports is becoming increasingly evident among the oil exporting countries...[D]espite the 'shut in and save' philosophy, uneasiness is appearing even in...rich states...over the continuing decline in oil offtake and what it might do to revenues, right now...[PIW 2-10-75:1]

Henceforth the chief topic at an OPEC oil ministers meeting was "sharing the losses" of sales volume. [PIW 3-3-75:4] The OPEC secretariat said production sharing was urgent. [PIW 3-10-75:10] Saudi Arabian output fell from 8.8 million in October 1974 to 5.65 million in March 1975. Some Saudi officials spoke in favor of reducing it to 3.5 mbd. [PIW 5-12-75] But soon thereafter, output rebounded to over 8 mbd, proving that these officials were either not in charge or were talking for effect.

The June 1975 meeting held the price, but announced an increase for October. [NYT 6-12-75:1] This raised spot prices months in advance: "The prospect of an OPEC price hike in October is breathing some life into the spot crude oil market in midsummer. ...[But] storage costs some 20c to 30c per barrel per month, so a big OPEC hike would be necessary to make inventory-building worthwhile." [PIW 8-2-75:5]

The October 1975 price increase was very imprecise, because they used (for the last

time) the fictitious "posted" prices which were merely an interim calculation toward setting per-barrel taxes. However, the Saudi "bottom line", government take, increased from $10.16 to $11.18 per barrel, and by more than most:

"Other governments [i. e. other than Saudi Arabia] have found it expedient to pay some homage to the forces of the market by putting up their prices by less than the agreed percentage...largely by trimming their differentials. But since departure from pricing norms tends to be anathema to all cartels, OPEC's Economic Commission has been trying to evolve an agreed scale of differentials...It has not been an easy task". ["Those Awkward Differentials", PE 12-75:444]

"Those awkward differentials" have bedeviled the cartel to this day. They offer an obvious subterfuge for price discounts, but this is less than half the story. Crude oil price differentials reflect differences in transport cost and in quality, i.e. in the value of the products which can be drawn from a given crude oil. But cost/quality differentials must constantly change, in response to seasonal movements, irregular inventory changes, and longer-term drift--and in expectations of all three. Hence a schedule of differentials which is in any sense "right" today will infallibly turn wrong, probably soon. If the sellers try to maintain the schedule, some crudes will be underpriced, and demand for them will increase, at the expense of the overpriced crudes. Hence the division of the market is undermined: some sellers will be selling more than their agreed share, some less.

In mid-1975, a special report warned OPEC ministers of the menace of differentials as a means of price discounting. [PIW 7-7-75:1] But "OPEC members head separate ways on premiums." [PIW 9-19-75:1] Over the years there have been repeated references to differentials as a divisive unsettled issue. But nothing has been done.

Under the old regime, the integrated oil companies did not respond much to the

differentials. They divided their liftings from the various nations in any way which the governments would tolerate. Small differences in realizations among crudes could easily be absorbed in wide profit margins. But this was no longer true after 1974, when the companies became buyers. The constant restless dance of delivered crude prices and product prices subverted the schedule of official f.o.b. crude oil prices.

Thus the "hawkish" Iraqis, who had demanded a 30 percent increase in 1975, actually cut prices in 1976 to gain more market share. [PE 9-76-338] These two actions were perfectly consistent. The optimal position for a cartelist is to join in fixing the highest possible cartel price, then take the smallest possible discount to sell more. Like most ideals, this is only to be approached, but the closer the better.

[FIGURES 5a-5c HERE] OPEC Monthly Capacity Utilization

Capacity Utilization Figure 5 shows capacity utilization[12] for Saudi Arabia and the rest of OPEC. The greater the excess capacity, the greater the strain on collusion. The higher the use of any nation's capacity, the better they fare at the expense of others. Saudi Arabia faced a never-ending adjustment. If they stuck with their official prices, they might lose business, perhaps suddenly, as happened to Abu Dhabi in 1975, Nigeria in 1977, and others. If they discounted too much, they might be passing up money they would otherwise earn, and at worst might bring down the whole price level.

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[12] The capacity estimates are from PIW. Those of the CIA appear to confuse technical/economic limits with policy limits in Saudi Arabia. PIW ceased to publish the estimates after 1985, but again published late in 1990. We have interpolated for the intervening years. CIA has improved its definition, but for consistency we have stayed with PIW.

Probably the most difficult year was 1975. OPEC financial surpluses were rapidly fading. In early 1974, the U.S. Treasury had predicted a peak accumulation of $650 billion; they now scaled it down to $200-$250. [PIW 5-26-75:5; 6-2-75:7] Yet despite slack demand the cartel gave very little price ground. Some of the credit must surely go to the Saudis. At the outset, they were doing much better in percent of capacity used. But in early 1975, which was a difficult year, they gave much ground, and during the next eighteen months they were obviously the restrictor for the other partners benefit. They now put an end to this.

The 1976 Saudi policy change During 1975 and 1976, the Saudi-Aramco negotiations dragged on, with nothing accomplished. But the Saudis made clear their concern with market share. They required the Aramco companies to lift a minimum of 7 million barrels daily.

As we have shown in early papers, Saudi Arabia was the price leader upward in 1970-71 and even more in 1973-74. The Shah of Iran talked a big game of hawk, but actually followed the Saudis, who also out-raised the others in 1975. But the loss of market share forced a change in Saudi tactics.

As in 1973 and in 1975, the expectation of an official OPEC price increase in December 1976 generated speculative demand, which began pushing up prices in August: "OPEC's coming hike spurs early moves to stockpile crude.... Spot crude prices start rising as OPEC hike looms." [PIW 8-30-76:1] The explanation foreshadows the elaborate number-crunching which came later, in the 1980s:

"With a $1-plus a barrel OPEC boost all but inevitable, crude buyers can afford to pay out the 25¢ to 85¢ a barrel of added financing and storage cost involved in buying oil

four months ahead of time.... Sometimes it backfires, though, as last May-June when OPEC-wide price hikes didn't materialize.... The specter of a big OPEC price increase Jan. 1 has snapped the crude oil market out of the summer doldrums as buyers rush to stockpile crude.... The current market surge is in sharp contrast to the early summer, when activity sagged in the aftermath of the June OPEC meeting." [Id.]

Continued stockpiling in anticipation of the January OPEC price increase made the spot price continue to rise through October. [PIW 11-1-76:7] But the spot products market was weak. Another OPEC price increase would depress an already sluggish recovery, and make it more difficult to pass higher crude prices on into higher product prices. [PIW 11-15-76:5]

At the OPEC meeting in Doha in December 1976, the majority wanted a 10 percent price increase, with another 5 percent in July 1977. Saudi Arabia proposed only 5 percent for the year. Neither side would give in, and the result was a 10 percent increase, Saudi Arabia in effect discounting from that by 5 percent. The simple strategy of a uniform price cut was their effective response to a lot of irregular discounts.[13] The effects are seen in Figure 5a: their percent of capacity utilized climbed to near equality with the others.

The speculative demand for oil dried up after the meeting. OPEC output fell from 33.6 million barrels daily in the last quarter of 1976 to 31.2 mbd in the first five months of 1977. [PE 3-77:102] The governments were forced to scramble for sales.

The payoff to underpricing We can make a rough calculation of the results. During the fourth quarter of 1976, Saudi Arabia had produced 27.56 percent of OPEC output.

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[13] One State Department economist stated it quite clearly in 1977. [Springer 1977] The document was declassified in 1990. Obviously, it had no effect higher up.

During the first five months of 1977, they produced 29.85 percent. [PE 7-77:255] Thus they sold 8.3 percent more, by means of a 5 percent price cut. At the lower prices they had greater profits than if they had joined with the majority. Of course this could not last long. "Hawkish" Iran tried to discount indirectly, through barter deals. [PE 3-77:102]

"For several months, the position of Saudi Arabia remained ambiguous. Then, in May 1977, Prince Fahd conceded in a newspaper interview that 'we are prepared to raise the price of our oil gradually between now and the end of the year'. Finally the breakdown of the so-called North-South Dialogue seems to have given the Saudis a reason, or excuse, to make the change sooner rather than later". [PE 7-77:255]

The final result was a "compromise", a price rise of 10 percent to which all subscribed. In the meantime, Saudi Arabia had gained market share and increased its revenues faster than did OPEC as a whole.

OPEC members who were slow to suspect cheating by their neighbors soon paid for their mistakes. "[Nigeria] thought it had an agreement with Algeria and Libya in 1977 to raise prices in concert. By the time they realized what was happening...they'd lost $1.5 billion in revenues." Between the Fall of 1977 and the Spring of 1978, Nigeria lost nearly one-third of its sales because they were less than 2 percent out of line on prices. [NYT 9-17-79:D1] It was an expensive lesson in the sensitivity of market share, and of earnings, to small price differences.

The surplus was worse in 1977. The Economist shared the consensus, but kept some distance:

"For a couple of years or so, until growing world demand catches up with the extra supply, OPEC is likely to find it difficult to make any real price rise stick... Oilmen hate short term gluts because they knock stock profits and undermine their increasingly frenzied predictions of long term scarcity." [Economist 8-27-77:88]

Later in the year:

"The first cautious glimmers of a slight price upturn are surfacing on the weak spot market..., mainly in anticipation of a possible OPEC hike next January. ...With oil in oversupply worldwide, spot prices of Middle East crude have eroded steadily since the OPEC price split was resolved in early summer." [PIW 10-17-77:1] [A week later, it was] "a world awash in surpluses for now." [PIW 10-31-77] [There was no] "fourth-quarter stockpiling rush...OPEC price rise prospects scarcely dent spot discounts." [PIW 11-14-77:1]

The spot market weakness was justified when the December 1977 OPEC price meeting could not agree on prices.

"The crude oil price freeze for which the Carter Administration was so ardently campaigning in the closing months of 1977 is now a reality...Basically, however, the price standstill is to be explained in economic rather than political terms...The ministers could not close their eyes to the over-supply situation evident in the markets for months past." [PE 1-78:2][14]

Conclusion: an effective cartel During 1974-77, sales were flat, and much excess capacity accumulated. The oil companies were needed more than ever to set prices above the tax floor and to allocate output, but they were gone, and the OPEC nations had to face customers directly. They had not instituted quotas, but there had been frequent or even continuous contact over market shares and cheating. They had held together, and even increased prices in the face of deficient demand. However, the continuing inflation had offset the increases.

ON THE EVE IN 1978

It was generally (and I believe correctly) believed that OPEC still had reserve or unexerted price-raising power, and the question was: how best to use it.

Restatement of the monopoly goal: cost of synthetics In April 1978, OPEC appointed

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[14] On how OPEC meeting promoted stockbuilding and speculative price increases, see also [Wigel and Sandoval, 1979]

a Long Term Price Policy Committee of oil ministers, chaired by Yamani. Their report was not rendered (and leaked) until late in 1979 [e. g. PIW 12-31-79:3; see also 3-3-80:1] but the policy agreement was simple and must have come much earlier. There were two essential points.

1 The long-term goal was to raise the price to a level just below the cost of producing synthetic liquid fuels. (cf. Al Chalabi quotation, above p. 14) Assuming demand is not responsive to price (cf. the Yamani statement at page 18 above), this is the correct goal for a monopoly. Once we suppress oil-on-oil competition, the only rivalry is from the nearest substitute.

The monopoly goal is often stated in a misleading way: that Saudi Arabia, Kuwait, et al., because of their enormous oil reserves, want to keep the price of oil low enough to discourage alternative fuels. But the "reserves" agreement is irrelevant. Fixing the price at a level just under the nearest alternative is the monopoly goal for all sellers, regardless of the size of reserves. Moreover, the "reserves" argument ducks the important question. Why do Saudi Arabia and others keep such enormous underground inventories, which cannot be produced for many years, and whose present value is effectively zero? (above, p. 7, 8) The simplest and best answer: because to produce more would flood the market and depress prices. They hold their low-cost oil off the market to allow the higher-cost producers a market share. Otherwise the high-cost producers would expand output and wreck the price.

Holding back lower-cost reserves is a second-best cartel strategy, of course. It would be optimal to produce in the least-cost areas and pay off the higher-cost cartel members

with a share of the profits. This is impossible in practice.

Given the monopoly target, the next question was: how fast to raise the price toward the target?

2 The Committee's rule was: increase the inflation-adjusted price of oil by the OECD growth rate. This is irrelevant in theory, but makes very good tactical sense. The rule limits increases to a very small percent each year. In case of recession the price would not increase at all. This would have avoided shocks to the world economy. Moreover, the tactic of slow increases would have corrected the Committee's mistaken assumption. We now know that the true monopoly ceiling was well below the cost of synthetics. Not only cost and gas, but capital and labor were substitutes. Demand was responding to price, and non-OPEC supply would keep expanding. Slow, cautious increases in the oil price would have "sensed" the barrier.

But within a year, the LTPPC's rules were flagrantly violated by the people who had stated them. Why didn't Saudi Arabia and the rest of the OPEC cartel follow their own good doctrine?

[FIGURE 5 HERE] Saudi Arabia Budget 1970-1987

The menace of deficits One sees the picture most clearly in Saudi Arabia. From 1970 to 1978, revenues (nearly all from oil) rose 21 times, but expenditures rose 31 times, from $1.4 billion to $43.0 billion. After that, revenues more than doubled, yet expenditures rose to equal them by 1982, and the Saudi budget has been in deficit ever since.

[TABLE VI HERE] Saudi Current Account 1967-1988

This was true of the whole Saudi economy. The massive 1974 Saudi current-account

surplus was washed away in just four years by much greater imports of goods and services. The 1980-81 surplus was almost twice as large as 1974, and it vanished twice as fast, in two years. This rising tide of spending should destroy the durable legend that the so-called "low absorber" OPEC countries really wished to keep oil in the ground, and to produce only enough to meet their "needs". If the Saudis had really been producing more than they wished, then by mid-1974, and ever afterward, they would have served themselves, and won thanks from all other producers, by making room for them, producing less. In fact, as noted earlier, they discounted prices and imposed heavy penalties on the oil companies for underlifting. Their strict enforcement is seen in 1978, when the eight-month average was 300 thousand barrels daily above the minimum, and was considered "too close to the line for long-run comfort". [PIW 10-16-78:5]

Cartel has short horizons, high discount rates [Adelman 1986] The cartel governments have shorter time horizons and higher discount rates than private companies operating the same oil reservoirs. This is not a matter of regional "culture." It is a rational response to circumstances.

OPEC must bear all the fluctuations in the world oil industry. Yet the OPEC governments are peculiarly vulnerable to income reductions. They are extremely undiversified. One asset, oil property, provides nearly all imports. The bulk of non-oil industries (particularly in the Gulf countries) depend on spending from oil income, and would vanish without it. No OPEC government has sold off some of the oil assets, to buy others and get some income diversification. Nor could it be sold for much. First, the risk discount is high, since it could again be seized. Second, the private operator

would be bound by OPEC restriction of output.

Domestic investment in OPEC was largely unproductive. [Gelb 1988] In Saudi Arabia, subsidies climbed to almost 80 percent of revenues. [Askari 1990, p. 112] These estimates are "on the low side" [Askari 1990, p. 106], and exclude weapons. Only 19 percent had "largely productive objectives." [Askari 1990, p. 116] It is unknown whether the petrochemical investments have paid anything.

The constant financial stress meant that the OPEC nations could not wait. Moreover, those at the Persian Gulf lived in a bad neighborhood, vulnerable to being mugged at any time. The only rational response was to grab what they could when they could. As it was said of them 40 years earlier: "The future leaves them cold. They want money now." Their very short time horizons and high discount rates drove them to raise prices too quickly for their own good, as we will shortly see.

Learning How to "Need" Our vision of Saudi Arabia and the other producing nations as seeking maximum wealth contradicts perfectly the official truth, especially in the U.S. Government. Saudi Arabia was (and is said to be) sacrificing by producing too much. They would prefer to produce only enough for their needs, and leave the oil in the ground. Thus Minister Yamani:

> "We were producing at a much higher rate than what we should for our economy. And that was a sacrifice on our part. This sacrifice should be appreciated by the whole international community so we can continue sacrificing, continue accumulating a surplus and losing money. [PIW 12-17-73:1]

Table VII gives seven such estimates. If what someone spends is an indication of what they need, then their needs increased eightfold, in just five years; taking account of inflation, about 5.4 times.

[TABLE VII HERE] Saudi Arabia "Needs"

The Carter Administration vision was similar to Nixon-Ford, which had favored accommodation with OPEC. Assistant Treasury Secretary Parsky had said in early 1976: "Breaking up OPEC would be detrimental to the direction in which we want to go." There were "lush export markets;" a Brookings study estimated that income growth would be slowed very little by the oil price increases; the State Department feared that disrupting OPEC would be "politically damaging" in the Middle East. [Time 1-19-76:54]

But the Carter team were much more articulate. [15] Mr. Carter believed that "Saudi Arabia is producing more oil than they want". [NYT 10-19-79:1] He "had regular and heavy correspondence with the Saudi leaders going back to late 1976". [NYT 7-12-79:A3] It has not been made public. Mr. Carter's advisor on Mideast crude oil matters was James E. Akins, the Ambassador to Saudi Arabia during the 1973-74 production cutback and "embargo", who had been dismissed from his post in 1975, and left the Foreign Service. [Adelman 1988][Adelman 1990] He believed price-fixing was a good thing.[16]

"[T]he Carter Administration has gone all out to cultivate the Saudis. Akins ...served as a campaign advisor to Carter, and went to Riyadh after the election to talk oil prices with the Saudis". [Joseph Kraft, in The New Yorker, 6-26-78]

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[15] President-elect Carter's economics task force, headed by Professor Lawrence Klein, had recommended an import quota auction system to undermine the cartel. [OGJ 1-3-77:31] It was not considered. (See also M. A. Adelman, "Oil Import Quota Auctions," Challenge, January 1976.)

[16] "Without price supports or acreage limitations on U.S. grain, the world price probably would drop. Consumers...would benefit greatly. But the advantage would be short term and short lived. In the longer term, American agriculture would be hurt, farm production would decline, and the world would face serious food problems." [OGJ 7-16-79:29]

As "President-elect Carter's special envoy" to the Persian Gulf nations, Mr. Akins stated in Kuwait that "a 10% OPEC hike in oil prices would be sufficient and acceptable." [PONS 11-24-76:1] Thus the incoming Administration, even before taking office, had sent a signal to raise prices.

Despite the record since 1973, of stagnant demand, excess capacity, and chronic price weakness, the Carter Administration believed in a permanent scarcity, hence the need for "special relationships" with Saudi Arabia and Iran to induce them somehow to produce more than would suit their economic interest. The 1977 CIA report forecast an early oil deficit, the Soviet Union turning from exporter of over 1 mbd to importer of 2.5 mbd by 1985, etc. [CIA 1977] The President feared that world oil reserves would all be gone by the middle of the 1980s. [NYT 4-19-77:A24] (At end-1977 they were nearly 700 billion; through 1978-1990 some 350 billion were used up; at end-1990 "remaining reserves" were just under 1,000 billion.)

At mid-year, Mr. Schlesinger "said that nothing can or will be done by the administration to try to break up the oil cartel... The Carter administration's strategy is to continue to improve relations with Saudi Arabia, which has been the moderating influence..." [WSJ 7-1-77:2] He later warned of "a major economic and political crisis in the mid-1980s as the world's oil wells start to run dry and a physical scramble for energy develops". [NYT 10-6-77:67] Shortly thereafter, the Secretary warned that the current oil glut would quickly disappear. As early as 1978, but no later than 1982, the lines would cross and demand exceed supply. [Schlesinger 1978, appended figure]

A respected Brookings economist, Arthur Okun, with close ties to the Administration,

thought strong action "essential if the nation is to have 'insurance against an energy catastrophe. The question is whether the American people will have enough maturity to act before the crisis hits.'" [Time 5-2-77:34, emphasis added] But he did not explain "catastrophe" or "crisis."

Undersecretary Cooper continued to believe that we lived in "an age of energy shortage" and that "economic expansion will sooner or later run into a shortage of oil at existing prices." [Cooper (1982), 1986 pp.53,66] He never explained what "shortage" meant, nor how shortage was compatible with great excess capacity, which OPEC struggled constantly to repress; and with even greater unused potential, at a cost (including return on investment) a small fraction of the price. He explained the 1973-1974 price explosion by a surge in demand (p.53), with no reference to supply. He did not try to explain why stagnant demand led to the 1979 explosion.

In 1977, an article obviously reflecting official thinking argued that high oil prices were good for the United States. [Washington Post 7-10-77] It followed that we would be better off with higher not lower OPEC prices. [Forbes, 3-20-78] In June, Yamani said "key U.S. officials have told him...that gradual price increases during the next several years are in the U.S.'s best interests." [WSJ 6-5-78:5]

The only place considered as a source of future supply growth was the Middle East. A Carter official said: "It's hard to bare our teeth at the Arabs when we're groveling for their oil." [WSJ 10-21-77:editorial] One does not see much with belly to the ground. A sub-cabinet member later boasted of "unprecedented closeness in the Middle East." [The Energy Daily, 4-3-78] Oil imports from Mexico had to be restrained in order not to

disturb "carefully cultivated relationships with the Middle East". [NYT 11-29-78:D1]

"It is becoming clear, in the words of a U.S. State Department economist, that 'the problems of Mexico won't be solved by oil...' Some even compare Mexico's breakneck expansion of oil sales to a derelict selling his blood in the morning to buy an afternoon bottle of wine." [WSJ 8-30-78:1]]

This was of course resented. When a Mexican offer of natural gas was rebuffed, the President of Mexico denounced "surprise moves and sudden deceit and abuse" as "poisonous fruits."

"The Energy Department veto of the gas deal so angered Mexican officials that Foreign Minister Santiago Roel called Energy Secretary James R. Schlesinger a liar". [NYT 2-16-79:A7]

"Bilateral relations" The nature of the "special relationship" with the Saudis et al. was never made explicit.

"During the 1970s, when oil prices were escalating, it was routine for the U.S. Treasury Secretary to be dispatched to major OPEC countries, chiefly Saudi Arabia and others in the Mideast to urge pricing moderation." [WSJ 7-25-88:3]

"To achieve the U.S. objective of access to adequate supplies at 'reasonable' prices, the United States uses its bilateral relationships with friendly producers in an attempt to influence their pricing and production decisions. This is especially apparent with Saudi Arabia, with which, according to a Department of State official, the United States has a 'very active' bilateral policy. Frequent visits by cabinet-level officials including the Secretaries of State, Treasury, Defense, and Energy, during the past several years illustrate this bilateralism." [GAO 1982, p. 49-50, emphasis added]

The alleged influence with Saudi Arabia recalled what Henry Adams wrote about the early 1800s:

"Spain had immense influence over the United States, but it was the influence of the whale over its captors--the charm of a huge, helpless, and profitable victim." [Adams 1986, p. 231]

The Schlesinger-Fahd meeting The previously secret record of one of these numerous visits was recently released: a meeting of the Secretary of Energy with Crown Prince (later King) Fahd of Saudi Arabia in January 1978. [Schlesinger-Fahd 1978] This document gives us a valuable window on the decision-makers' mind-set, and on their knowledge.

1. "[T]he Soviet Union will soon find its oil production declining." [Par. 15] In fact, it increased over the next 12 years. It then decreased because it was mismanaged and under-maintained, not because the oil gave out. Even in 1991, it equalled 1976.

2. "[T]he outer limit of [Saudi Arab] feasible production is on the order of 14 million barrels per day." [Par. 21] In fact, in 1972 Aramco, with Saudi approval, proposed expansion to 20 mbd. [PIW 10-9-72:3] In 1973, an Aramco vice-president, in an internal Aramco communication said "... you could go a lot higher than [20 million]." [7 Church 540] In January 1974, the Aramco chairman and a vice-president had stated Aramco could produce 20mbd "on out through the end of the century without any problem at all." [NYT 1-29-74:39] Later the CEO of Chevron had testified Aramco could go from around 8 mbd to beyond 20 million; it would require 8 to 10 years. [7 Church 453] In 1977, Aramco estimated that on the basis of current reserves it could produce 25 mbd. [PE 7-77:286] Current reserves were 150 billion barrels, hence this would have maintained a 16.5:1 reserves:production ratio; the usual industry rule of thumb is 15:1.

3. "Five to seven million barrels per day would satisfy [the Saudi government's] current cash requirement." Table IV above shows how Saudi "requirements" had soared over a few years. The higher the income, the higher the needs. At the very least,

assuming static revenue needs would seem remarkably shortsighted. Saudi Arabia was in budget deficit in 1978.

4. "It is true, of course [sic], that oil in the ground would be a better investment for Saudi Arabia than the alternatives which are now available for investment of its cash revenues..." [Par. 15]

a. Mr. Schlesinger was ostensibly trying to persuade the Saudis to invest more in oil production, and to charge less for their oil. He tells them that "of course" they would lose money by investing to produce, they only sell to do us a favor, they really don't want to sell. One wonders: what would he say to discourage investment, and raise prices?

b. The Department of Energy had in 1977 forecast world crude oil prices increasing by no more than 3.5 percent per year, real. [DOE 1977, vol. II, pp. 8-9] That would be the maximum return on holding oil in the ground rather than selling it off. One tries to imagine an investment banker (Mr. Schlesinger's current vocation) advising a client to make a risky investment for a maximum 3.5 percent return.

Summary The Washington view was the international consensus view, shared by everybody who was anybody, and expressed in thousands of pages, best summed up by a group of experts in March 1978 [Rockefeller 1978].

"The weight of expert opinion, reflected in numerous studies based on quantitative analyses, is in substantial agreement on one key point: the world is presently heading toward a chronic tightness, or even severe shortage, of oil supply." (vii)

The current surplus (March 1978) was "ephemeral." They feared "preemption" of oil supply "by the few nations better able to pay for it." They urged the importing and

exporting governments to "develop a common approach to cope with a potential chronic energy supply crisis."

> "The industrial countries must find incentives for oil exporters such as Saudi Arabia, the United Arab Emirates, Kuwait and Libya, which do not have an immediate need for all the resulting revenues for economic development, to produce nevertheless at the highest feasible levels. Among the incentives are ... inclusion of exporting countries in the periodic economic 'summit meetings' of the world's economic and political leaders.... The report underlines the importance of U.S. relationships with Saudi Arabia and Iran. (Summary, pp. 2-3)

Soon thereafter, in June 1978, the International Energy Agency estimated world demand for OPEC oil in 1985 as 45 ($\pm$3) million barrels daily, with available production only 37($\pm$1), i. e. a "gap" of 8 mbd. [PE 8-78:328]

In the official view, the current "glut" masked the fact that oil was becoming increasingly scarce. Furthermore, the markets could not allocate, could not equate amount supplied with amount demanded. There would be a "scramble" for oil. The Saudis might expand output, against their economic interest, but only because of US influence.

Belief in fiction is a fact. Given the dominant attitudes in the consuming countries, the OPEC governments felt free to do as they wished.

The USA-Saudi agreements Early in the Carter Administration, there was an agreement with the Saudis whereby they would provide

> "oil price moderation and sufficient oil supplies to meet the needs of the West and Japan. As a result, the Saudis say, they became the pricing moderates of OPEC constantly fighting for lower prices and agreeing to produce more crude so that tight suppliers wouldn't force up prices." [WSJ 7-18-80:25]

This seems to imply that previously they had <u>not</u> been moderates. Be that as it may, later, in 1978, there was an agreement between the United States and Saudi Arabia,

providing that the Saudis would maintain output, in return for which the USA would not buy oil for the Strategic Petroleum Reserve, which had been mandated by a 1975 law, and which the oil producing nations openly disliked. The agreement is described in [NYT 2-29-80:D1].

Neither report of an agreement was denied at the time by any Administration officials.[12] Any denial later is a self-serving declaration by an interested party, and deserves no weight.[13]

THE PRICE EXPLOSION 1978-1981

Spot prices kept sliding throughout the first half of 1978. "Opinions on the size of the crude supply surplus still vary between 1- and 3-million b/d, with Saudi Oil Minister Yamani putting it at 2-million recently". [PIW 5-22-78:3] In May 1978, despite "a hot denial of any collective action on production controls" [id.: 4], there was a secret OPEC decision to impose a production program; it was only revealed years later. [PIW 9-22-80:5] [PIW 3-29-82:S1]

Perhaps because of the secret accord, demand and spot prices then strengthened. What may also have helped was a Saudi requirement that Aramco produce more heavy and less light crude oil. Strictly enforced, it would have cut Saudi production by something

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[12] In contrast, a report of an alleged deal with Saudi Arabia on another subject was quickly denied. [NYT 7-12-79:A3]

[13] Mr. Schlesinger has also testified that there was no treaty violated by the Arab oil embargo in 1973, when he was Secretary of Defense. [IRS 1991, Tr.500] But according to [NYT 12-19-73:12]: "Specialists in international law in and out of the Government" considered the embargo a violation. "[T]he State Department is aware of the treaty but is reluctant to discuss the matter..."

between 1 and 2 million b/d. [PIW, 2-27-78:3, 5-22-78:3] By June it was thought that the Saudi output reduction would help lift spot prices, and hence "justify" an increase in official prices. [PIW 6-19-78:1] Minister Yamani spoke in favor of small price increases annually [PIW 6-26-78:1] But in July "no major price recovery [is] seen on [the] spot crude market." Buyer resistance seemed to be based on "substantial surpluses in producing capacity." [PIW 7-10-78:3] But by August, anticipation of a higher official price at the forthcoming OPEC meeting was thought to be pushing spot prices up. [PIW 8-14-78:5] Shortly thereafter,

"It's almost, if not quite, a repeat of the summer 1976 crude oil stockpiling game: oil companies are lining up extra supplies to beat the almost certain OPEC price rise in January." [But not all companies were doing so, since interest carrying cost was 8-10 cents, and leased storage charges 12-15 cents, per barrel per month.] [PIW 9-4-78:1]

The cartel was trying to repeat its success in 1975 and 1976: hold back production and raise prices in the face of declining demand and overabundant supply.

Worldwide consumption kept falling. OPEC 1978 sales were down 6 percent from 1977, by about 2 million barrels daily. In September 1978, the OPEC Secretary-General warned of the vanishing current-account surplus. [PIW 10-2-78:Sup] Figure 4b shows that through October 1978, the spot price was a good proxy for contract deliveries made for Saudi, Iranian, and UAE (mostly Abut Dhabi) crude oil, all staying close to each other. This is characteristic of a "quiet" balanced market.

Year-end Uncertainty At the end of October, the Iranian oil workers' strike sent spot prices up. The uncertainty was hardest to bear:

"The losses could be 'made up' if Saudi Arabia and Abu Dhabi eased their restrictions, but not otherwise". [PIW 11-6-78:1] ..."The spot market has come to a sudden and

complete stop....Virtually no crude was being offered for spot sale after the export slash in Iran. Suppliers are hanging on to every drop they have until it's clearer how long the Iranian supply disruption will continue..." [Id.:5, (emphasis added)]

Then Iranian output resumed[14], but everyone expected higher prices to be enacted at "OPEC's Momentous Meeting" [PE 12-78:498].

"Anticipatory buying has caused the spot markets to harden in recent months....The only question is the size of the expected increase." [id 499]

Spot prices dropped in early December [PIW 12-4-78:1], and an end-year assessment was for OPEC prices to be raised about 15 percent to put them in line. "The main hard-liner, Iraq" seemed ready to accept that much. [PIW 12-11-78:3,5] Without any public announcement, the United States honored its agreement (above, p. 42) and ceased after November 1978 to buy oil for the Strategic Petroleum Reserve. [PIW 3-26-79:7]

Summary of supply/demand in 1978-1979 One cannot explain the price changes of 1978-79 by insufficient supply. From end-September 1978 to end-July 1979, there was much more than enough unused capacity available to take any strain.

[TABLE VIII HERE] Production and Capacity, Mideast OPEC 1978-1979

In the last quarter of 1978, inventories [CIA:IESR] actually rose contra-seasonally, i.e. the world produced more than it consumed, when it would normally have been consuming more than it produced. In the first quarter of 1979, the inventory drawdown was actually less than in the sluggish first quarter of 1978. After that, production always exceeded consumption.

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[14] The Khomeini regime ceased exports to Israel, which tried to import crude oil from Europe. Both the British and the Norwegian governments refused to allow shipments. [OGJ 4-9-79:99] This use of the oil weapon seems unimportant.

The only reason for a price hike at this point was fear of possible loss of supply. To normal demand for use there was added precautionary demand, for hoarding. This raised the price. Since the markets expected more such price increases, there was suddenly added speculative demand, as in previous years, but much larger. All traders tried to buy, and to hold what they had. Only those would sell who were bound to do so by contract. The higher prices went, the higher they were expected to go. The more buyers wanted to buy, the less sellers wanted to sell.

Year-End Strain Fear and uncertainly had been promoted by the reluctance of Saudi Arabia and other Gulf producers to expand output freely to the limits of capacity, to expand capacity by "de-bottlenecking."

In early November:

"Saudi Arabia has quietly ruled out any further immediate expansion of its petroleum output to replace supplies withdrawn from world oil markets by turbulence in Iran....To fill in some of these supplies on the world market, the U.S. companies that account for the bulk of Saudi Arabia's oil output had asked the Saudi petroleum ministry for permission to remove temporarily some of the production constraints that restrict the flow of oil from Saudi Arabia.

Neither the U.S. oil companies nor the Saudi government will comment on the development, but it was learned that the Saudi answer was negative. [WSJ 11-13-78:4]

With this assurance, the December 1978 OPEC meeting duly raised 1979 prices, by quarters, at an annual rate of 14.5 percent. According to the Petroleum Economist, this was "certainly" more than the U. S. Secretary of the Treasury had hoped, on his November visit to the Persian Gulf states to urge price moderation. The OPEC nations also agreed in principle to increase the premiums on light crudes, but in practice this would have required a highly detailed slate of differentials, on which, as always, they

could not agree. [PE 1-79:2 and PIW 12-25-78:1]

As Iran's output shrank from 6.1 million barrels daily in September 1978 to 2.4 mbd in December, Saudi output expanded from 8.4 to 10.4. Others also expanded, and as earlier seen, spot prices even decreased in December, as the alarm eased.

The January Coup In January, Iran was out of the world market, producing only 0.4 mbd, for domestic consumption. For the first 19 days, Saudi Arabia was producing at 10.4 mbd. "[This] was still below the 'sustainable' ... cited by Oil Minister Yamani recently." [PIW 1-29-79:5] In mid-January, the new head of OPEC said: "I think the supply and demand is already balanced." [NYT 1-19-79:D1]

But during the second week in January, a report spread that Saudi Arabia was about to lower production.[15] Mr. Schlesinger said it could have "a very severe effect at this time". [PIW 1-15-79:1]

[Another observer said:] "It's one thing for the Saudis to use the 8.5 million allowable in normal times to create a nice tight supply situation. It's another to use it to create a world crisis." [Id:2]

During the third week of January, spot product markets, already under strain because of "refiners' unwillingness to let go of product supplies," were thrown into a panic by heavy buying by major oil companies. [PIW 1-22-79:3,5] The companies already knew what would soon be made public: Saudi output had been cut by 2 million barrels daily on January 20, 1979 - a date to remember. During the week of January 22, an auction in Abu Dhabi set record high prices and contributed to "the spot price panic now

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[15] The Saudis called their cut to 9.5 an "increase," since it would be a million more than their "normal" ceiling of 8.5 mbd. [WSJ 1-30-79:12]

sweeping across the world market for OPEC crudes". [PIW 1-29-79:3]

By the last week in January, the shock was worldwide:

"Exxon inaugurated a sweeping 10% worldwide cut [in deliveries]--about 400,000 bd. And other companies were expected to make added reductions.... Exxon...carefully made no reference to developments in Saudi Arabia...But customers feel the timing is no coincidence since it comes on the heels of the substantial cut in Saudi crude output in the latter part of January." [PIW 2-5-79:1]

"The Saudi decision to scale down its production from a level well over 10-million bd has caused intense consternation in international oil circles and consuming countries. ...'It's the difference between the current tight supply and an acute shortage', one observer notes. Aramco's production...was ranging between 10.2 and 10.5 million bd in the first half of January....Aramco had to slash its output substantially, and by late January ranged about 8 million bd." [Id:5]

Secretary of Commerce Juanita Kreps had been in Riyadh just before the cut, and "Saudi officials had 'assured' her that oil production would continue at a 10- to 10.5 mbd rate 'for some time to come'." [PIW 2-5-79:6] But cut it was, by over 2 million bd, though it went back to 9.5 in February, for the time being.[16] Only then did Secretary Schlesinger allege that the cut was "for technical reasons", i.e. inability to exceed 9.5 mbd. [PIW 2-12-79:2] There was no support for this novel thesis. Saudi Arabia had produced a million b/d more, and would soon do so again. Other estimates of capacity were at or even over 11 mbd. [PIW 12-25-78:1] [PE 8-78:333] Of course, capacity figures are always uncertain; the important thing was that Saudi Arabia refused to try and find the limit.

Because supply was now more uncertain than ever, buyers were more avid, and sellers more reluctant. The spot price kept rising throughout January and February, then paused

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[16] Defense Secretary Brown "was plainly exultant about his meetings in Saudi Arabia." [NYT 2-13-79:A10] What he exulted over is unknown.

in March. Private and governmental oil companies kept raising official prices toward spot levels. Having caused spot prices to rise by cutting output, OPEC governments "justified" their price increases, as merely "matching the market."

The second larger shock By early March, Iran production revived, though at lower levels. It was offered at spot prices only. [PIW 3-5-79:1] Minister Yamani said Saudi Arabia would stick with its official prices for the first quarter. But it would not increase output past 9.5 mbd, and indeed "hoped" to decrease to 8.5 mbd. [PIW 3-6-79:6]

In mid-March, there was bewilderment over rising prices despite largely stagnant demand and adequate oil inventories. An oil executive explained:

"When Iranian oil went off the market, OPEC tacitly agreed to limit production. It's much simpler to limit production so that price increases are automatic. The OPEC nations are acting the same way the Texas Railroad Commission did for 30 years." [NYT 3-18-79:E5]

The TRC, as it often reiterated, never fixed prices, but "only" controlled production. By late March, spot prices had apparently peaked, and decreased mildly. [PIW 2-26-79:1] The OPEC meeting of March 26 had to face the danger that the return of Iranian output would make prices collapse. Yamani accused Iraq of producing more than it had admitted. (See below.)

"[T]here was a general understanding reached at the Geneva OPEC meeting...that those countries that raised production during Iran's revolution will reduce output now. But there already are signs of differences over who should cut back and by how much." [WSJ 3-30-79:7]

During the first week in April, spot prices slipped. [PIW 4-9-79:3] The trade watched Saudi Arabia, since

"It was Saudi Arabia that started the OPEC price acceleration when it levied the planned fourth-quarter OPEC price on its "extra" oil supply earlier this year. Expectations are

growing, meanwhile, that Saudi Arabia may be close to cutting back its 9.5 million barrels daily production to its normal 8.5 million ceiling, since Iran's volume is now in the 3 million bd range. So far, there's been no official cut in the Saudi volume, but there are hints it may be scaled down gradually as 'market supply conditions warrant'. Aside from Saudi Arabia, every OPEC nation is now scrambling to add extra charges...The big question is whether the pricing free-for-all will continue or simmer down a bit now that spot crude oil prices will continue to ebb." [PIW 4-9-79:1]

"One sign of the spot price decline is the increasing nervousness among some crude oil traders with high-cost supply to resell. But one optimistic trader suggests, 'If Saudi Arabia cuts production...' [Id:3]

He need not have worried. While Carter Administration "officials said the Saudis, by keeping oil production at nearly 10 million barrels a day...were making sacrifices to benefit the West," [NYT 4-3-79:A7], the Saudis had already cut production from 9.5 to 8.5 mbd at the beginning of April.

"'One must question the sincerity of Saudi desire to keep prices from escalating', one supply specialist comments. 'If the Saudis really wanted to keep the lid on prices, they could have maintained their production at 9.5 million. That would have kept the pressure on the upper-tier price producers'". [PIW 4-16-79:1]

Yamani issued a command to the United States on any Strategic Reserve purchases: "You have to stop this right now." [PIW 4-2-79:4] In fact, they had already stopped, and there was no indication they would resume. (See Appendix B)

The Saudis could have effected a price rollback by producing at their limit of 10.4 mbd. But there was no reason of self-interest why they should do so. "OPEC price rises rekindle Europe's spot markets" [Id:6]

The Oil & Gas Journal reported a Geneva agreement by Saudi Arabia and the others to cut production. [OGJ 4-16-79:52] With more perspective, in May 1979 they appraised the end-March meeting and its results:

"Object of the cutbacks...is to keep the market tight and let the pricing initiative remain

with OPEC members. There was suspicion that the established Saudi policy of moderation might mean a slow return to...8.5 million b/d....But the Saudis were extremely prompt...Questions were also asked about the willingness of Iraq to ease back. Iraq tries to keep its production figures secret. And although the Baghdad regime admitted to increasing output from 2.5 million b/d to between 3-3.1 million b/d, ...Yamani claimed that the actual figure was nearer 3.5 million b/d." [OGJ 5-21-79:35, See also PIW 4-2-79:1]

Brinkmanship The trade was more sensitive and the renewed squeeze on output made spot prices surge even more in May than in January and February. Official prices took off in pursuit.[17] Secretary Schlesinger "stressed that since 1977 he has been warning [of an] inevitable deficiency in supply." [OGJ 6-4-79:55] While the spot price soared, the actual volume shrank. In the third quarter of 1978, it was estimated at 2 to 3 million barrels daily; in May 1979, some estimates were as low as 1 to 2 hundred thousand barrels daily. [PIW 5-14-79:1]

In July there was a price pause, and time for appraisal.

"Officials of the European Economic Community, who have just completed an initial exchange of views of members of OPEC, report that the overall objective of the exporters' organization is to keep exports running slightly less than world demand so high prices can be maintained....A policy of maintaining a small crude supply deficit is economic brinkmanship, said Guido Brunner, EEC commissioner for energy". [OGJ 7-9-79:35]

If the OPEC nations guessed wrong, not they but their customers went over the brink. As in January, probably all they wanted was "a nice tight supply situation". But they were willing to risk "a world crisis".

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[17] Apparently "irrational" (actually quite rational) behavior was also seen in the tanker market, where lower oil flows went together with higher tanker rates. "Buyers desperate enough for oil to pay up to $30...are making sure they can transport every drop they get. [S]omebody who has found 360,000 barrels...[is] likely to engage two 200,000 tankers rather than one 350,000 tanker...One broker estimated that 10 to 15 percent of the tanker space was now carrying air." [NYT 6-5-79:D1]

The 1979 economic summit of the seven leading OECD nations adopted national oil-import goals to "eliminate the need for any significant increase in OPEC production through the mid-1980s, something the cartel should find pleasing." [WSJ 7-2-79:1, emphasis added] They must really have believed that the cartel nations wanted to sell less oil.[18] "Western consuming countries do not want oil prices to fall significantly, at least for now, because this would lessen the incentive to reduce imports and develop alternative supplies..." [NYT 7-19-79:D5] Saudi Arabia drew praise from the Tokyo summit by saying that it would "never" [sic] permit prices to exceed $20. [NYT 6-22-79:D5] "Never" was three months. In October 1979, the Saudi export price exceeded $20, and kept rising.

While the spot price went to nearly $35 for Arab Light or equivalent, producing countries raised prices haphazardly by imposing surcharges. To align them, another OPEC meeting was held at end June 1979, whose "primary pricing achievement...was to bring Saudi Arabia into closer proximity with the higher-priced OPEC majority". [PIW 7-2-79:1] However, the price schedule was so distorted, with disparate prices for comparable crude oils, that oil company executives called it "a blueprint for chaos" [Id]. There were "tantalizing Saudi production-rise hints" [Id:3]. In fact, production was raised

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[18] Earlier we showed that channeling all excess demand into the spot market raised prices there disproportionately. The political attacks on spot sales, in which foolishness the French exceeded even the Americans, made things worse, but probably not much. Far more serious was the slow and lagging response of wholesale and retail prices of oil products. In part, the lag was institutional, in part the result of formal and informal price controls. Everyone in the chain was on notice that as the higher crude prices worked into the system, wholesale and retail prices would increase. It was an almost riskless investment to buy every bit of oil available, whether for later use or for resale. Excess demand increased at both the crude and the products level.

to 9.5 million b/d at the beginning of July, and the spot price explosion stopped. However, official prices kept rising.

The path of prices Toward the end of July 1979, despite high capacity utilization throughout OPEC, in the 85-90 percent range, inventories were already close to "the peak of the oil glut last year." [WSJ 7-30-79:1] And already some OPEC members were cutting back production to maintain prices. [NYT 7-31-79:D5]

In September and October, a replay was developing:

"Fear and uncertainty over the oil supply outlook are now the cement holding the spot market for OPEC crudes together....Supplies around the world are ample, storage is rapidly filling...Without the anxiety over OPEC's supply and price intentions, the spot crude market could collapse almost overnight...." [PIW 10-1-79:1]

In October, "OPEC session raises oil glut specter....Speakers called for production controls." A good sign of price weakness was when various delegates "again urged a 'dialogue' between producing and consuming countries." The UK Energy Minister attended the meeting and offered himself as a broker. [OGJ 10-15-79:103]

Oil companies ceased to sell crude and became buyers. BP, previously the most striking example, turned from a net seller of 2.4 mbd to a net buyer [PIW 11-5-79:1] -- its customers had to turn to the national oil companies. This was a mere transfer of demand, not an increase, but the uncertainty surrounding the customer switch increased precautionary demand.

Had Saudi Arabia raised output to its announced capacity of 10.8 million b/d at end-1979 [PIW 2-4-80:9], and committed itself to stay there, to say nothing of expanding output, it would probably have pricked the bubble, and brought prices down. Instead, they kept the pot simmering; they would promise to hold for no more than three months

at 9.5 mbd. [PIW 10-1-79:12] During October and November 1979, as the OPEC nations kept raising official prices, this reluctance to reassure markets about their production level generated a fresh scare over supply, and spot prices went to a new high of $39. Saudi Arabia did not immediately raise its official price.

"But some insiders are betting that its anticipated January [1980] price boost might be made retroactive, and their question is, how far back? [Perhaps] ...even for the entire fourth quarter. In any case, the steep profit gains of the U.S. partners in Aramco were publicly criticized by Oil Minister Yamani recently. Such a ploy would help soak up such gains from fourth-quarter operations." [PIW 11-5-79:3]

After the last spasm of the spot market, in November 1979, there was a ten-month slide. Typically, it was much slower than the upsurge. When long term policy was discussed at the December 1979 OPEC meetings, the worry was about too much oil not too little:

"A degree of 'production management' [was suggested]. One proposed tool is an intra-OPEC financing facility that would provide a 'safety net' so that financially strapped members wouldn't have to produce their oil at a high rate to secure revenues. This would be almost tantamount to the perennial production programming idea, ... experts point out." [PIW 12-31-79:4]

In early 1980, as in 1974, spot prices turned down, but contract prices kept rising. As early as February 1980, the talk was of "apportioning cuts" among Persian Gulf producers. [OGJ 2-25-80:31] Minister Yamani said "the rising oil surplus exceeds the current production-cutting possibilities of OPEC." [WSJ 3-6-80:2] By March 1980, the "spot crude market shows symptoms of coming apart," and the peak was recognized as the previous November. [PIW 3-10-80:1] [PIW 3-17-80:1] Production cuts were being made for supposedly "technical reasons" but they were really for lack of customers. [Id.:5] But sellers continued to raise contract prices during the second quarter. [PIW 4-7-

80:1]

In May 1980, another official Saudi price increase to $28 aligned it with Venezuela, Kuwait, Iraq, Qatar and Indonesia. (Iran, Nigeria, Libya, and Algeria were still pricing near spot.) [PIW 5-19-80:4] Thus the Saudi export price can be taken as a surrogate for most other OPEC prices. By June 1980, official prices were still being raised, but more slowly, because spot prices were weak. "Refiners are no longer willing to pay 'anything' to secure a long-term direct supply contract from OPEC producers." [PIW 6-9-80:3]

Although the Saudis kept raising their price, they kept it safely under their rivals'. As the others cut back output in response to shrinking demand, Aramco kept at a steady high rate. Figure 5b shows that the parting of the ways was in January 1980, and it kept widening for two years. In May, Saudi Arabia said it planned to maintain the "temporary" 9.5 mbd rate through the year-end. [PIW 5-12-80:3] At the June 1980 OPEC meeting, it was generally expected that Saudi Arabia would raise its price to $30 (as indeed they did). But the Saudis' rivals saw no need to come down because they could only see the price continuing to rise. By August 1980, official and spot prices had converged (Figure 4b), amidst trade talk of burdensome stocks whose private carrying cost was reckoned at 15 percent interest plus $2.50 per barrel per barrel per annum. [PIW 8-18-80:3]

In September 1980, the OPEC deputy secretary-general, who was its senior pricing expert, expected the oil price to "gradually" approach $60 because that was the cost of synthetic oil. [NYT 9-2-80:D3] OPEC Secretary General Ali M. Jaidah predicted that the Saudi "marker price" would soon be increased. History disproved "the common and

widespread fallacy" that prices could not be raised in a time of glut: they had been, in 1974, 1975, and 1976. But to do it again, a collective production allocation scheme was needed now. [PIW 9-15-80:1] He was right as to history, and right again on the need for allocation. But the fact that OPEC members had raised prices profitably during past gluts did not imply that they could do so during any and all gluts.

But Ali Jaidah's forecast that "the [Saudi official] marker price will soon be adjusted above its current level although the market is characterized by excess supplies" was almost immediately fulfilled by Saudi Arabia. [PIW 9-22-80:1] One reason was "a tacit gentlemen's agreement for a quasi-general OPEC production cut." It was "similar to the unofficial 1978 agreement to reduce output levels due to a previous surplus." [PIW 9-22-80:5] [NYT 9-18-80:D1] [NYT 9-19-80:D1] As previously, Saudi Arabia backdated the increase (to August 1), and the Aramco companies were stuck with the bill for $728 million, since the oil had already been sold. [PIW 9-29-80:7]

The Saudi official price now equalled the spot price. The outbreak of the Iran-Iraq war in September 1980 again raised spot prices in October and November, but--the usual asymmetry--the gains of two months were lost over the next seven. By June 1981, the official Saudi price was actually 25 cents over the spot. Over the next 18 months, the official price nearly always exceeded the spot price.

Appraisal: Saudi soft words and hard actions Should one regard the two Saudi output cuts, in January 1979 and in April 1979, as deliberate duplicity? Did the Saudis lull the United States into expecting support and then as was said of them in 1975 "pull the rug out"? Without pretending to know their minds: I do not think so. Saudi Arabia

and the other Gulf producers were trying to fine-tune the market with coarse instruments. Their concerns were the same as ever: block the threat of price erosion, and move the price up toward the eventual ceiling. They did not plan a shortfall and a wild gyration in price, but they were willing to risk it in order to avoid a surplus. Once the price rocketed up, they acted to maintain it. In order to avoid dangers and seize opportunities, they freely disregarded agreements, not for the first time. Their mistake was in believing in zero price elasticity, and in under-estimating non-OPEC supply. We examine this later.

[TABLE IX HERE] SAUDI OIL EXPORTS & REVENUES, 1970-1990

Success for OPEC as a whole is measured by its total revenues. Success for any given country is measured by its share. From 1973 through 1981, OPEC revenues rose by a factor of 33, but Saudi revenues by a factor of 94. Minister Yamani and his aides deserved well of their country.

"Political events" It is widely believed that the price explosions of 1973 and 1979 were things that just happened; as . . . Under-Secretary of State for Economic Affairs recently put it, "political events". [NYT 3-1-91:D2] Or that the price increases were really not desired by the OPEC nations, some of whom even resisted in vain. There is no truth in either legend. The detailed record shows that both price explosions were the work of the OPEC nations, led by Saudi Arabia. There could have been no spot price increases had they not cut production at crucial moments. Soon thereafter, the spot market would have sunk or collapsed because of excess capacity, and even excess current production, had not the OPEC nations ratcheted up their official prices and cut

back production. Minister Yamani said in January 1981 that "prices increased in 1979-80 as a result of another corrective action", as in 1973. [PIW 3-9-81:S1] A "corrective action" is conscious and deliberate.

In the swift rush of events, it was hard to keep the long term strategy in view, and to modify it as information changed. The monopoly goal was to equate the price of oil with the cost of non-oil equivalent fuels. The $7 price floor set at the OPEC December 1973 meetings was the then-current estimate. (Above, p. 13)

But in the short run the price could be set nearly anywhere, so long as output was restricted. So even as spot prices fell in 1974, with the crumbling of precautionary and speculative demand, official contract prices moved steadily up. Moreover, this impulsive short-term behavior was justified by events. It soon became clear that competing liquid fuels were far away, and much more expensive. Hence the Long Term Price Policy Committee re-stated the previous goal, without putting a dollar figure on it. And they added the right note of caution: approach the goal by raising the price in small increments.

In fact, the true ceiling was much lower than the cost of non-oil fuels. It was set by consumer reaction and, to a lesser degree, by competing output. At the prices of the mid-1970s, oil lost ground, and OPEC as residual monopolist ("swing producer") lost doubly. The price could have been raised above 1978 levels, but only to a limited extent. All this would have been sensed in time had they adhered to the Committee recommendation for a slow advance. They would have adapted to the new conditions of Table III above. Instead they rushed ahead to raise the price in 1979 through 1982,

and by the end of 1983, the real value of their exports was actually less than before the price explosion. They took the "corrective action" in one long gulp. The short horizons of the OPEC nations, and their looming deficits, were among the devils who made them do it. The worldwide delusion of long-run scarcity was another.

AFTERMATH 1979-1982

[FIGURES 4a-4c HERE] Crude Oil Prices

Demand and competitive supply Figures 4a-4c and 5a-5c show how difficult it is to build a model of a cartel-dominated market. The similarities between the first and second price explosions are clear, but so are the differences.

In 1979-1981, as in 1974, after the first price explosion, spot prices fluctuated while the OPEC nations kept raising effective contract prices despite massive excess capacity. Each time, production was restrained to validate the higher contract prices, the expectation of which had raised spot prices. But in 1974 it took only six months to equate spot with contract prices in July 1974; the second time, it took more than two years from the end of 1978 through July 1981.

The second oil shock, like the first, set off a world recession, which both accentuated and concealed the reaction of oil consumption to price. Oil consumption declined from 1973 through 1975, but then it grew slowly, going past the 1973 peak in 1977. The drop after 1979 was much stronger, because as Figure 2 shows the reaction to price change was much stronger than after 1973. In fact, the market economies' consumption ex-OPEC has yet to surpass the 1979 level.

Plainly, much of the reaction to the first price explosion was still going on in 1979, and

the reaction to the second was superimposed on it. Moreover, although the proportional increase in 1979-81 was much less than after 1973, the absolute increase was greater. The reward to substituting away from oil was now much larger per barrel avoided, and this, I believe, increased the price elasticity of demand.

Non-OPEC supply had increased from 1973 to 1978, by 3.5 mbd; in the next five years, by 3.4 mbd. North American output was almost unchanged, the startup of Alaska offsetting declines elsewhere. But Mexico and the North Sea added 3 mbd, and the Soviet exports about another half mbd. Elsewhere, small increases balanced small gains. As in the earlier period, the higher prices failed to elicit more supply, and may have inhibited it because of the consensus view that prices would soar in the long run. This elicited ever more grandiose notions of the inherent value of oil in the ground, and ever higher demands by governments upon oil operators. They were most clearly expressed in the Canadian National Energy Plan of 1980, which was one long drool over expected oil and gas rents. [Canada 1980] But there is a reward to honesty: two years later Canada reconsidered, more quickly than any other nation. [Canada 1982] Even so, Canadian gas which could have been sold under long term contract at nearly $5 was sold years later at around $2. The postponement and decline together wiped out some 75 percent of the original capital value.

The combined effect of lower consumption and more non-OPEC supply was a plunge in OPEC exports. From 1973 to 1978, they had mildly declined, from 29.5 mbd to 28.4, but by 1983 exports were only 14.3 mbd. The cartel nations' loss of half their market share greatly weakened their control. Had other things remained equal, it would have

taken twice as big an output change to generate the same price effect. In fact, Table III showed (above, page 17), matters were a bit worse. The elasticity factor in 1983 (assuming crude:product ratios unchanged) was approximately 0.50/.318, or 1.57, as compared with 0.32 in the last pre-explosion year, and 0.69 in 1978, before the second price jump.

Yet despite this market pressure, the price was quite steady through 1982, the spot price occasionally registering some downward pressure, which was soon overcome. Even the 1983 adjustment was minor. Holding the price line from 1980 through 1985 showed great cartel cohesion. But power is not wisdom. The real value of OPEC revenues in 1983 was actually less than in 1978, just before the second explosion. The cartel had fixed a price above the profit-maximizing level, and should have lowered it for their own sake.

But with price fixing as with singing and mountain climbing: it is much easier to go up than to come down. Nearly every cartel member by 1983 was overspending its revenues, and its cash squeeze made it bitterly resist any reduction in price or in quota volume. The cartel members could not agree on a deal to benefit them all.

[FIGURE 7 HERE] CRUDE OIL PRICES (1990$/barrel)

Long run scarcity The consensus view was stronger than ever: we knew it all along, the permanent shortage is already upon us. Prices had to keep rising because of increasing resource scarcity. The cartel -- if there was a cartel -- did not matter. Figure 7 is the consensus view of a large number of expert advisors. Over the 1980s, whatever the initial position, from it prices had to increase. There was a widely-publicized report

by the staff of the Senate Foreign Relations Committee. Supposedly, continuing reserve reassessment in Saudi Arabia "has led to decreasing reserve estimates." [Reprinted PIW 4-23-79:S3] "Shrinking Reserves of Oil Worry OPEC Policy Chiefs." [PIW 9-24-79:1] The story reads quite like 1990-1991.

The CIA report of August 1979 deserves to be as well known as the 1977 report:

"The gas lines and rapid increases in oil prices during the first half of 1979 are but symptoms of the underlying oil supply problem--that is, the world can no longer count on increases in oil production to meet its energy needs." [CIA 1979, p. iii][19]

James Akins addressed an OPEC seminar in October 1979. For the moment, OPEC needed to prorate output to maintain the price. But soon "we shall enter a period of permanent oil shortage," and "semi-anarchy in energy, with the richest and strongest of the consumers making bilateral deals with OPEC." Exporting countries might refuse to produce and sell oil for dollars. Hence, the USA should offer an inflation-proof bond as inducement.[20] [PE 12-79:506]

Early in 1980, the CIA said it had been vindicated; criticized as too pessimistic, it had not been pessimistic enough.

"We believe that world oil production is probably at or near its peak and will decline throughout the 1980s....Simply put, the expected decline in oil production is the result

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[19] The gasoline lines were unrelated to scarcity, and reflected only price regulation and product allocation. [DOE 1987, p. 36] No other country suffered such a purgatory.

[20] Akins attended President Carter's happening or "domestic summit" of July 9. [PBS broadcast 7-9-79] But he broke with the Carter Administration because he opposed a rapid deployment force for the Persian Gulf [PE 8-79:337] and vehemently opposed the Camp David accords between Israel and Egypt. He no longer had any comparable connections or influence in the US Government; henceforth, his statements become less important to the historian.

of a rapid exhaustion of accessible deposits of conventional crude oil....Politically, the cardinal issue is how vicious the struggle for energy supplies will become." [CIA 1980]

Within OPEC countries, oil consumption had increased from 1975 to 1980 at an annual rate just over 10 percent, to 2.4 mbd. The OPEC Secretariat expected it to keep rising at that rate through 2000 AD, when it would equal 16.7 mbd. This would cut greatly into exports. OPEC nations "have greater obligation toward satisfying their domestic requirements than meeting external demand." [qu. PIW 9-8-80:1] Nobody asked how they would eat if they did not export.

An Algerian consultant said:

"But if OPEC production capacity seems to be adequate to meet the consumer's expectations, at least until the mid-1980s, the question remains, of course, whether indeed OPEC should accept to supply the world as and when needed. The easy answer to this is "no." After all, to convert a non-renewable resource of appreciating value into a monetary investment of declining value, scarcely seems the best way to serve the future generations of OPEC member countries. Self-interest would dictate that producers should supply no more oil than their local consumption and financial needs require...[PIW 9-22-80:S3]

Of course consumer governments had long been saying this, especially in the United States. In mid-1980, the IEA issued yet another (but milder) warning of an approaching 1985 "gap," supply outrunning demand. [PIW 6-16-80:5,7]

No purpose would be served by examining the gaps-and-gloom literature. They were upside-down pyramids. Bulky projections balanced on the point of a few unwarranted assumptions. But they were important because they were believed.

The Iran-Iraq war: origins How successful the "gentlemen's agreement" for a production cut (above, p. 56) would have been will never be known. At the end of September, Iraq attacked Iran. It is only partly correct to view the Iraqi attack as an

exogenous event, originating outside the oil market. True, the Iraqi government recalled the battle of Qadisiyya in 637 AD when the Arabs had given "those insolent Persians" a good beating; it was time to give them another. These 1350-year-old hatreds are doubtless good for another 1350 years.

But high oil revenues provided the means and the motive for the war. Billions had been spent on weapons. The Iranian Revolution--itself a response to the petrodollar flow--had weakened the Iranian armed forces. This lowered the risk trying the hostile takeover of an attractive acquisition--the Arab-speaking province of Khuzistan (or Arabistan) which produced the great bulk of Iranian oil, nearly all within 150 miles of the Iraqi launching point. The return on investment would have been very high. Iraq's venture in Iran came so close to success that an attack on Kuwait looked all the better in 1990.

Thus the cartelized oil market generated the war. Its feedback effect on the market was very favorable. In mid-1978, the combined capacity of the two countries was 11 mbd, and expected to go much higher. Two years later, it was down to 6 mbd, and remained there to 1990.[21] Revolution and war were to the oil market like epidemics and famines to population control.

The Iran-Iraq war: consequences "Everything has changed but nothing has changed"

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[21] Much Iran production was quickly and permanently lost. Nine-tenths of the foreign technicians had been sent packing early on [PIW 3-5-79:2], and even native ones were lucky to be merely jailed. By January 1980, one oil industry executive estimated, less than 5 percent of the top Iranian technicians remained with the NIOC (National Iranian Oil Corporation). Expansion of capacity had depended on a huge gas-injection scheme, which was now scrapped. [PIW 3-5-79:2; and 9-24-79:S] As this is written in 1991, it is still being discussed, not planned.

was the supply experts' opinion. "It would take a five-month shutdown just to erase the existing surplus--and another year just to fully deplete all readily available world inventories." [PIW 9-29-80:6] [There was also available excess capacity.]

Saudi Arabia forthwith (starting October 1980) raised production from 9.5 to 10.4 mbd. They continued to underprice. The famous "Aramco advantage," which so irked other oil companies, made it profitable for the Aramco companies to continue lifting all the output (though a Saudi national company marketed a substantial fraction). Saudi Arabia kept increasing the price, but always stayed below other producers, who again chased up after the spot price.

"At the back of even militant Oil Ministers' minds is the longer term fall off in demand for OPEC crudes that is now seen increasingly widespread....A market crunch between OPEC members themselves as soon as Iraq and Iran resume substantial exports is another preoccupation. Iran especially...won't find it easy to persuade others to move over and make room in the market. Saudi Arabia carried the burden of a previous market shift in 1975....But Yamani has indicated that Saudi Arabia is not ready to repeat anything along these lines until it gets concrete understanding for cooperation on long term OPEC strategy." [PIW 12-15-80:1, 2]

In January 1981, the prospect of more contract price increases ceased to affect the spot market. [PIW 1-5-81:1] But later in January, "Fear of soft market seems behind the latest Mideast price rise." [PIW 1-19-81:1] This upside-down thinking makes good enough sense in a cartel market, and we have already seen it repeatedly: collusive action to set a level about which the spot price fluctuates. A deliberate price increase stops the rot in spot prices, and raises the level from which, at worst, they will tend to decline.

By July 1981 spot prices were back at the lows of August-September 1980. At this time, the market was unified, i.e. spot and contract prices, Saudi and non-Saudi, were approximately the same. By late September 1981, some of the "Aramco advantage" was being lost. The partners had accumulated huge inventories, which they now had to

begin selling off at discounts of about $1 per barrel. [PIW 9-28-81:3] As usual, in October "spot prices [were] rising on hopes for OPEC accord" [PIW 10-19-81:1], and again they were not disappointed. Saudi Arabia raised its marker price from $32 to $34, and the whole structure went up accordingly. There was even an accord on price differentials, for 40 days, until the regular December meeting. [PIW 11-2-81:1]

But after July 1981, the Saudis' contract price remained above spot and above the occasional Iran contract sales of which we have record. For the rest of the year, and the first two months of 1982, they enjoyed the best of both worlds: high price and high offtake. The Aramco companies only started to cut liftings in September 1981, as the other OPEC members began to use the new Saudi high of $34 as a fine discounting benchmark.

A cycle of Saudi policy As we saw earlier, Saudi Arabia had led the way to higher prices in 1974. They soon became the unwilling "swing producer" or cartel restrictor. Then they underpriced profitably in 1977. But by August 1978 their market share was down again.

The Iranian Revolution had offered the Saudis an opportunity which they had handled well: scaring the market by opportune output cuts helped the price explode; the shutdown and only partial revival of Iranian production gave them a high market share. Then from mid-1979, underpricing had given them almost three years of continuous very high market share and capacity utilization, even when they had ceased to underprice. One should not seek in this conduct a master plan, but one does see a consistent strategy--raise price and try to avoid being the restrictor, or residual supplier.

But there could be no resting on laurels. By mid-1981, the "Aramco advantage" of lower prices was gone. By 1982, it had become, to the delight of other companies, the Aramco albatross of higher prices. Saudi Arabia cashed in on the Aramco companies' illusion that their "position" in Saudi Arabia, or their "guaranteed access," or something, was worth the drain of several billion dollars a year.

Some shed the illusion more slowly than others. In December 1980, Mobil announced participation in some Saudi industrial projects. In return, they would have "access" to an additional 1.4 billion barrels over 15 years. The deals were part of "Mobil's continuing efforts to cement its relationships with Saudi Arabia in order to guarantee access to crude oil." [NYT 12-10-80:D20] "Access" was mentioned three times in two paragraphs. The obsession with "access" probably delayed the Aramco companies' cutbacks of overpriced oil. But by September 1981 they began cutting back, and after June 1982, Aramco capacity use was below other OPEC nations; by December it was a third lower.

In a later paper, we will see how the Aramco refusal to lift overpriced oil opened a new chapter in the cartel's history. The jostlings of 1974-76 over market share, Saudi underpricing in 1977, distress and a secret collusive agreement in 1978, the second price explosion, the proposed "safety net" of December 1979, the "gentlemen's agreement" of 1980, the relapse of Saudi Arabia into swing producer, and the half-baked attempt at quotas in early 1982, now had to give way to formal fixed quotas in March 1983. But the OPEC nations, unlike the multinational companies, could not manage an orderly retreat. Price attrition was succeeded by collapse and partial revival in 1986.

Henceforth, there was reliance on quotas, and prices were treated as mostly indicative. Consumption and OPEC production revived appreciably after 1986, and prices held. Non-OPEC production contracted in the USA, kept expanding elsewhere. This increase, in the face of a catastrophic oil price drop, was not promising for the future of the OPEC nations. But the chorus of long-run scarcity never faltered. Then in 1990 the flow of oil money into weapons became the vehicle of the second Iraqi super-investment, the seizure of Kuwait.

[FIGURE 6 HERE] Saudi Arabia Revenues & Expenditures, 1970-1987

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APPENDIX A.

Were the Saudi output cuts in retaliation for Camp David?[22] This has been suggested from time to time. The agreements between Israel and Egypt were made in September 1978. In October Robert Mabro called them "unacceptable to Arabs." [PIW 10-2-78:3] After their ratification in March 1979, "Saudi Arabia issued a call for war against Israel" [WSJ 3-22-79:1]. This, with similar news from Iraq, depressed the dollar [Id:16] but at no time did the Saudis mention any oil action to stop or affect the agreements.

In April 1979, Mabro elaborated:

"Saudi Arabia is made responsible for the health of the dollar. Every time [Secretary of the Treasury] Blumenthal has reason to worry about the dollar, he takes the plane to Riyadh. ...More recently they [Saudis] were presented with the nice dilemma of Camp David... [which puts them] at the risk of betraying their Arab responsibilities and the national feelings of their own population, thus putting their own internal security at risk. What sort of friend is it that puts you in such a dilemma?" [PIW 4-30-79, Sup. 4]

Undoubtedly he spoke for the Saudis, but Mabro stopped short of calling the output cuts and price increases a reaction to Camp David. A more direct spokesman was the U.S. Embassy in Saudi Arabia. "If we could do [what the Saudis wish,] they would give us all the oil we need and at good prices." [BW 4-9-79:99] They did not say what the "good prices" were, nor how long they would last.

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[22] Camp David was not a Carter Administration initiative. It was unwelcome at first and perhaps at last. "Sadat's deed [the visit to Jerusalem] was to face America with a fait accompli: direct diplomacy between the region's two most formidable military entities. It was not to America's liking, but the Egyptian-Israeli relation had to be underwritten; that was the meaning of the Camp David meeting and of the Egyptian-Israeli treaty of March 1979. It was initiated by the two parties and blessed by a cornered America." Fouad Ajami, The Arab Predicament (Cambridge: Cambridge University Press, 1981), p. 163.

In May 1979, there was a report that "Saudi Arabia is prepared to greatly increase its oil production 'but we will not be able to do so until peace is established in the Middle East.'" [WSJ 5-11-79:25] In fact, they did increase output from 8.5 to eventually 10.4 mbd, without anything having happened.

In July 1979, "Washington officials with close Saudi ties...view the [July output increase] as giving [the U.S.] six months to achieve results, "particularly a solution to the problem of the Palestinians". The officials also noted that OPEC would meet again in mid-December, "as the six-month period draws to a close." [NYT 7-10-79:A1] Nothing more was heard of this.

In fact, the supposed connection between Camp David and output restriction makes no sense. If the Saudis and other Arab producers wished to modify or prevent the Camp David agreements, they should have threatened or promised during the six months between signing and ratification. Then if ever, they might have exerted some influence. The fact that they did not protest or threaten is evidence that the production cuts were simply to profit themselves.

APPENDIX B.

SAUDI ARABIA AND THE STRATEGIC PETROLEUM RESERVE (SPR)

Early in 1978, Secretary Schlesinger

"came to an informal understanding with Saudi oil officials...under which they would increase production to meet a world shortage...Persons privy to the discussions...said the Saudis, in return for increased production, extracted from American officials a promise not to use the oil for the [SPR]." [NYT 2-29-80:D1]

The Saudis cut production when it suited them, to raise prices. The Americans went beyond their promise, and stopped all SPR purchases in November 1978. Imports for SPR dwindled rapidly from a peak of 245 tbd in December 1978 to zero by September 1979. [MER, various issues]

By late 1979, as already seen, the world market was in surplus which increased steadily through 1980. One could no longer pretend that filling the SPR might cause higher prices. But the Carter Administration would not resume without prior Saudi approval. [NYT 2-22-80:D1] The Saudis urged delay was "necessary to help bolster the power of pro-American Saudi officials and offset the efforts of militant pro-Arab groups seeking to gain control of the kingdom." [NYT 2-29-80:D1] "In Saudi Arabia, many senior officials are anxious to cut exports as soon as possible to placate conservative Moslems, who regard high oil production as an unsound concession to the U.S." [WSJ 2-29-80:6] No matter how often disproved by experience, this inside-dopester line rarely fails to impress American officials.

The Administration then proposed an agreement which "could give the Saudis an unprecedented degree of control over the use of America's strategic petroleum reserve." But the Saudis rejected the idea. [WSJ 2-29-80:6] As was revealed soon afterward, the

United States therefore canceled the plan to resume filling the SPR "in an effort to placate Saudi Arabia." [NYT 5-23-80:A1]

By early March, a spokesman for the DOE said it was "pursuing the dialogue on this issue with other oil exporters...He said the United States would not go ahead with the decision to fill its reserves until an agreement with these producers, including Saudi Arabia, was reached." [NYT 3-4-80:D9] And on his return from Saudi Arabia, where the royal assent had been refused, Secretary Duncan said resumption of SPR refill would be delayed. [NYT 3-6-80:D1] Minister Yamani "didn't leave any doubt regarding Saudi opposition to additions to the U.S. oil reserve."

A month later, the Administration let it be known that refilling would resume in July 1981 at the rate of 100,000 bd. The ultimate size was reduced from 1 billion to 750 million by executive action, which the statute permitted. [NYT 4-22-80:D9] Since SPR had 92 million barrels, this meant nineteen years to reach even the lesser target. A month later, the intention to fill was reiterated,

"despite opposition from the Government of Saudi Arabia...mainly because it lessens their influence on United States foreign policy. 'The administration's action on filling the reserve is going to undercut the power of the pro-American element in the Saudi royal family,' one analyst of Arab affairs said here, adding 'There is going to be a great deal of fallout in the Arab world on this one.' [NYT 5-23-80:A1]

The underlined sentence is of course the threat that never fails to be made, most recently in 1991. At any rate, Venezuela took the news seriously, and offered to sell oil for the SPR.

"The Department of Energy, however, refused to entertain the proposal, out of fear it might compromise Energy Secretary Charles Duncan's agreement with Saudi Arabia not to resume filling of the strategic reserve; in return, Saudi Arabia would continue to produce more than its nominal 8.5 million barrel-per-day ceiling." [The Energy Daily 6-6-80]

In August, the Saudis were not expected to cut production despite the resumption of fill. "But the U.S. plays down the stockpiling resumption anyway, to avoid irking the Saudis; officials issued no announcement of their action." [WSJ 8-7-80:1]

All this time Congressional impatience was building up. Hearings were only the tip of the iceberg. [OGJ 5-5-80:138] There was much testimony by Abram Chayes, special adviser on SPR to Secretary Duncan. "He spoke of the possibility of raising the eventual level to 200,000 or 300,000 [barrels daily]..." Thus the goal might--possibly--be reached before 1999. Chayes would not admit any Saudi pressure influenced DOE. Senator Bradley said he was "less than candid." [The Energy Daily, 9-23-80:1, and 9-26-80:1; emphasis added] SPR imports were finally resumed at a very low level in September 1980, and never regained the old high until April 1981, under the Reagan Administration.

Some time before September 1980, Secretary of Energy Duncan was angered by too-prompt receipt of some purchased oil, because it might offend the Saudis. The Energy Department's denial of the discomfiture was believed by nobody. [WSJ 10-27-80:1] Later the General Accounting Office recommended faster filling of the SPR:

"Despite abundant supplies, the United States has refrained from bidding for oil in the open market. This is widely thought to reflect a sensitivity to the wishes of Saudi Arabia..." [NYT 11-3-80:D1]

At about this time, Saudi Arabia was "pressing" the Carter Administration to stop an antitrust inquiry into Middle East oil pricing. "State has already asked that parts of the probe be halted." [OGJ 12-24-79:NL2] The U.S. Government did not stop the inquiry, but in response to Saudi objections the Department of Justice dropped its demands for

Aramco documents which were in the United States, and which they had the legal power to obtain. The Reagan administration also held back, and finally decided to end the inquiry.[23]

Twice in a year, the Saudis could veto the enforcement of U.S. law in the United States. Such was the "bilateral" relation. (Above, p. 39)

[23] I worked on the inquiry as an economic consultant to the Department of Justice. My opinion, for what it may be worth, is that the decision in December 1983, to end the investigation, was correct because there was no evidence of market power by the Aramco companies. Conceivably my opinion might have been different had the documents in question been obtained.

TABLE I. MARKET ECONOMIES' CONSUMPTION & OPEC EXPORTS, 1973-1990
(in millions of barrels daily)

	ME CONSUMPTION	ME ex-OPEC	OPEC PRODUCTION	OPEC EXPORTS	OPEC SHARE (PCT)
1967	30.8		16.9		
1968	33.5		18.8		
1969	36.6		20.9		
1970	39.5		23.5		
1971	41.6		25.4		
1972	44.5		27.2		
1973	47.8	46.3	31.0	29.5	61.7
1974	46.3	44.7	30.7	29.1	62.9
1975	45.2	43.5	27.2	25.5	56.5
1976	48.1	46.1	30.7	28.7	59.7
1977	49.4	47.2	31.3	29.1	58.9
1978	50.2	47.8	29.9	27.5	54.7
1979	51.3	48.7	31.0	28.4	55.4
1980	48.6	45.7	27.0	24.1	49.6
1981	46.8	43.8	22.6	19.6	42.1
1982	45.2	42.0	19.3	16.1	35.6
1983	45.0	41.5	17.3	13.8	31.8
1984	45.9	42.0	16.7	12.8	29.6
1985	45.9	42.0	16.1	12.2	27.2
1986	47.2	43.4	18.7	14.9	31.6
1987	48.2	44.4	18.2	14.4	30.1
1988	49.9	46.1	20.4	16.6	33.3
1989	51.0	47.1	22.6	18.7	36.7
1990	52.2	48.3	23.9	20.0	38.2

Source: BP Annual Statistical Review
OPEC consumption from CIA

TABLE II. OIL CONSUMPTION AND REAL GDP
Major Market Economies, 1960-1990

OIL CONSUMPTION IN BARRELS PER DOLLAR GDP

	USA	JAPAN	FOUR EEC*	TOTAL
1960	2.68	1.14	1.02	1.93
1961	2.67	1.25	1.14	1.96
1962	2.63	1.32	1.28	2.01
1963	2.61	1.56	1.42	2.07
1964	2.54	1.69	1.52	2.08
1965	2.50	1.89	1.65	2.13
1966	2.49	1.95	1.74	2.16
1967	2.52	1.90	1.80	2.19
1968	2.59	2.09	1.89	2.28
1969	2.65	2.27	2.05	2.39
1970	2.77	2.45	2.10	2.48
1971	2.77	2.54	2.14	2.51
1972	2.83	2.42	2.20	2.54
1973	2.82	2.58	2.18	2.56
1974	2.74	2.55	1.98	2.43
1975	2.70	2.25	1.87	2.33
1976	2.76	2.27	1.85	2.35
1977	2.76	2.36	1.80	2.35
1978	2.69	2.19	1.76	2.28
1979	2.59	2.22	1.77	2.23
1980	2.40	1.91	1.59	2.03
1981	2.19	1.79	1.46	1.86
1982	2.14	1.64	1.40	1.79
1983	2.05	1.53	1.35	1.71
1984	2.02	1.53	1.34	1.70
1985	1.92	1.40	1.28	1.61
1986	1.93			
1987	1.91			
1988	1.90			
1989	1.85			
1990	1.79			

*France, Germany, Italy, UK

SOURCES:
Oil Consumption: US:DOE/EIA, 1988 Annual Energy Review
Real GDP: Alan Heston and Robert Summers, "A New Set of International Comparisons of Real Product and Price Levels for 130 Countries, 1950-1985," Review of Income & Wealth, June 1988, pp. 1-25. Real GDP is expressed in 1980 U.S. dollars. Estimates are based on Purchasing Power Parity indices obtained from the UN International Comparisons Project.
Estimates for USA, 1986-1990, from Monthly Energy Review.

TABLE III. CONSUMER PRICE AND CRUDE PRICE 1972-1981

	P R I C E					
	(1)	(2)	(3)	(4)	(5)	(6)
YEAR	SAUDI F.O.B.	W. EUR. CONSU-MER	CONSU-MER GOV'T TAX	F.O.B. SHARE	OPEC MKT SHARE	OPEC ELAST-ICITY FACTOR
1972	1.88	10.40	5.60	0.18	0.57	0.32
1973	3.25	13.65	6.60	0.24	0.62	0.39
1974	10.17	22.55	7.85	0.45	0.63	0.72
1975	10.87	27.10	10.40	0.40	0.57	0.71
1976	11.62	27.20	9.70	0.43	0.60	0.72
1977	12.38	29.20	10.50	0.42	0.59	0.72
1978	12.70	33.80	13.40	0.38	0.55	0.69
1979	17.28	46.00	16.50	0.38	0.55	0.68
1980	28.17	63.00	21.20	0.45	0.50	0.90
1981	32.60	65.00	20.50	0.50	0.42	1.20

Sources:
Saudi F.O.B., from MER, various issues.
Saudi 1972 spot price used as surrogate for 1972 F.O.B. price
Western European consumer price and tax: ultimate source, Royal Dutch/Shell
See P.I.W. 1-28-80 and 2-8-82. 1981 data courtesy of Napier Collyns
OPEC market share from Table I
Elasticity factor is f.o.b. share of consumer price, divided by market share, i.e. column (4)/ column (5)

TABLE IV. IPAA INDEX OF DRILLING & EQUIPPING COST PER WELL
(1982 = 100)

YEAR	INDEX	AVERAGE DEPTH (000 feet)
1963	16	
1964	16	
1965	18	
1966	19	4.462
1967	20	4.391
1968	22	4.739
1969	24	4.879
1970	26	4.915
1971	27	4.840
1972	30	4.975
1973	32	5.032
1974	36	4.661
1975	43	4.653
1976	46	4.579
1977	53	4.699
1978	61	4.785
1979	71	4.696
1980	79	4.481
1981	92	4.557
1982	100	4.474
1983	79	4.182
1984	74	4.339
1985	76	4.475
1986	78	4.554
1987	70	4.512
1988	89	4.674
1989	84	4.523
1990	81	4.681
1991		

Source:
Independent Petroleum Association of America, twice-yearly Report of the Cost Study Committee. The base year has changed several times, and is put here at 1982=100 for convenience. It can be shifted to any other year. The series is "cost per well." It is only mildly affected by the changing average depth per well (from Joint Association Survey), and sometimes perversely. Adjustment for depth cannot be done by substituting the series "cost per foot." Footage not available before 1966.

TABLE V. OPEC EXCESS CAPACITY, AUGUST 1974
(in million barrels daily)

			EXCESS CAPACITY	
COUNTRY	CAPACITY	PRODUCTION	AMT	PCT
Algeria	1.1	0.9	0.2	18.2
Ecuador	0.2	0.1	0.1	58.3
Iran	6.5	6.1	0.4	6.2
Iraq	2.5	1.8	0.7	29.6
Kuwait	3.8	2.0	1.8	47.4
Libya	3.0	1.4	1.6	53.3
Qatar	0.7	0.5	0.2	25.7
S. Arabia	9.7	8.5	1.2	12.4
UAE	2.3	1.9	0.4	15.9
Venezuela	3.5	2.9	0.6	18.3
Indonesia	1.5	1.5	0.0	0.0
Nigeria	2.4	2.4	0.0	0.0
TOTAL	37.1	29.9	7.3	19.6

SOURCE: PIW 10-14-74:7. Ultimate source was a study by Chase Manhattan Bank under FEA contract. Arithmetical errors in source corrected.
NB: FEA says capacity increasing to 41.8 mbd next year [1975]. A further "steady increase" would bring 44 mbd by 1976, but no assurance of actual development. Increase of 4.7 mbd per year implies 390 tbd addition per month.

TABLE VI. SAUDI ARABIAN CURRENT ACCOUNTS, 1972-1990
(in billions of US dollars)

Year	Exports	Total Receipts	Total Goods & Services Imports	Current Account
1967	1.5	1.7	1.5	0.1
1968	1.7	1.9	1.8	-0.1
1969	1.8	2.0	1.8	-0.1
1970	2.1	2.4	2.0	0.1
1971	2.6	2.9	1.6	1.0
1972	3.9	4.4	1.9	2.1
1973	7.5	8.3	4.9	2.5
1974	30.1	32.7	8.2	23.0
1975	27.3	30.6	12.5	14.4
1976	35.6	40.2	21.6	14.4
1977	40.4	46.5	29.1	12.0
1978	37.0	43.5	38.9	-2.1
1979	58.1	65.8	47.8	11.2
1980	100.7	112.0	59.3	42.8
1981	111.8	127.8	75.7	41.1
1982	73.9	92.9	75.5	7.6
1983	45.7	66.0	73.5	-17.0
1984	37.4	55.0	64.6	-18.4
1985	27.4	43.4	48.0	-12.9
1986	20.1	34.1	38.1	-11.8
1987	23.1	36.2	37.8	-9.8
1988	24.3	37.1	35.5	-7.3
1989	28.3	41.3	40.0	-9.2
1990	44.3	56.8	44.9	-4.1
1991				

SOURCE: International Monetary Fund, International Financial Statistics (1990 & September 1991). The current account balance equals receipts, less net imports of goods and services, less "unrequited private transfers," which are largely remittances by foreign workers. Other components cannot be traced. Transfers to foreign governments can be derived by subtraction in the above table.

TABLE VII. SAUDI ARABIA "NEEDS," REVENUES, IMPORT SPENDING

	YEAR	SOURCE	"NEEDS" (MBD)	ACTUAL REV/BRL ($)	IMPLIED "NEEDS"	ACTUAL REVENUE	ACTUAL IMPORTS
					---- ($ BILLIONS/YEAR) ----		
1	1973	Aramco	5.5*	1.6	3.2	4.3	1.97
2	1975	Yamani	3.5				4.21
3	1976	Al Dukhail	4*	11	16.2	34	8.69
4	1976	Akins	3	11	12.2	34	8.69
5	1976	Nazer	5	11	20.3	34	8.69
6	1977	Yamani	3.75*				14.65
7	1978	Schlesinger	6*	11.7	25.6	34.6	20.35

Sources:
* denotes mid-point of range of one or one-half mbd
Actual revenue, total and per barrel, from Petroleum Economist.
Actual import expenditures, from IMF, International Financial Statistics.
1 Hearings before the Subcommittee on Multinational Corporations, U.S. Senate (Washington, 1974), vol. 7, p. 528.
2 MEES, 6-6-75:13 Quoted in Oil Daily, 10-28-76:1
4 MEES, 11-1-76:S4
5 Id.
Note: Quoted also by Yamani, MEES 6-6-75, including rising production to 7 mb/d by 1979/80. PIW 6-9-75:1, indicates 5 mb/d first year, then 7 mb/d afterwards.
6 MEES 7-18-77:8
7 Schlesinger-Fahd 1978

TABLE VIII. PRODUCTION AND CAPACITY, MIDEAST OPEC 1978-1979
(in millions of barrels daily)

MONTH	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN	JUL
IRAN PRODUCTION	6.05	5.49	3.49	2.37	0.40	0.76	2.22	4.13	4.11	3.94	3.77
NON-IRAN: PRODUCTION	16.21	16.74	18.31	18.13	17.89	18.06	17.85	16.93	17.06	17.19	18.18
CAPACITY	22.35	22.35	22.35	22.35	22.19	22.04	21.89	21.74	21.59	21.44	21.29
EXCESS	6.13	5.61	4.04	4.21	4.31	3.98	4.05	4.81	4.53	4.25	3.11

SOURCE: PIW 1-29-79:9 and 2-4-80:9

TABLE IX. SAUDI OIL EXPORTS & REVENUES, 1970-1990

	EXPORTS		REVENUES	
YEAR	MBD	PCT OPEC	BILLION $US	PCT OPEC
1970	3.7	0.166	1.2	0.155
1971	4.7	0.194	2.1	0.179
1972	5.9	0.232	3.1	0.216
1973	7.8	0.261	5.1	0.224
1974	8.5	0.287	22.6	0.250
1975	7.1	0.278	25.7	0.271
1976	8.3	0.288	33.5	0.289
1977	9.0	0.306	38.6	0.312
1978	8.1	0.290	34.6	0.299
1979	9.2	0.319	57.5	0.295
1980	9.6	0.389	102.0	0.366
1981	9.8	0.471	113.2	0.448
1982	6.3	0.373	76.0	0.376
1983	4.5	0.292	46.1	0.287
1984	4.3	0.279	43.7	0.274
1985	2.9	0.188	27.0	0.203
1986	4.7	0.305	20.0	0.267
1987	3.8	0.238	23.0	0.237
1988	4.5	0.254	21.0	0.238
(new source)				
1988	4.3	0.257	20.5	0.237
1989	4.3	0.227	24.0	0.206
1990	5.6	0.278		

SOURCES:
1970-74, Petroleum Economist, vol. 42, March 1975, p. 84
1974-80, Petroleum Economist, vol. 48, June 1981, p. 232
1980-88, Petroleum Economist, vol. 56, July 1989, p. 214
1988-90, export volume, Shell Review; export value, OPEC Statistical Bulletin.

Figure 1. Non-Communist World (NCW) Consumption & OPEC Production & Exports, 1967-1990

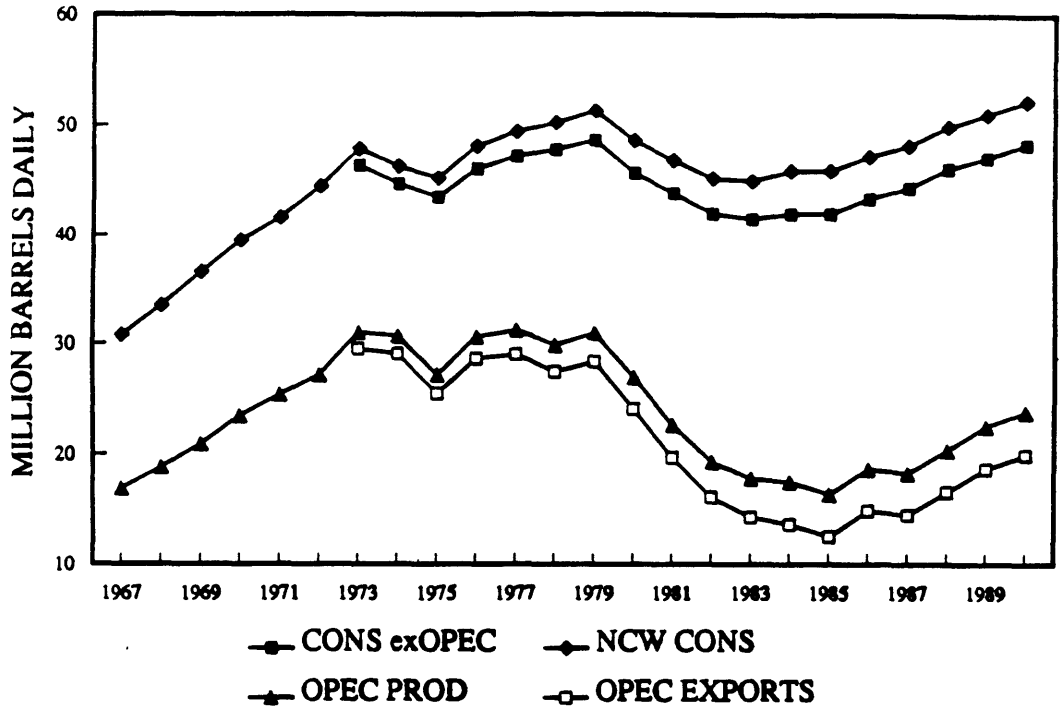


Figure 2. Oil Consumption & Real GDP
(Barrels per Year/$ per Year)

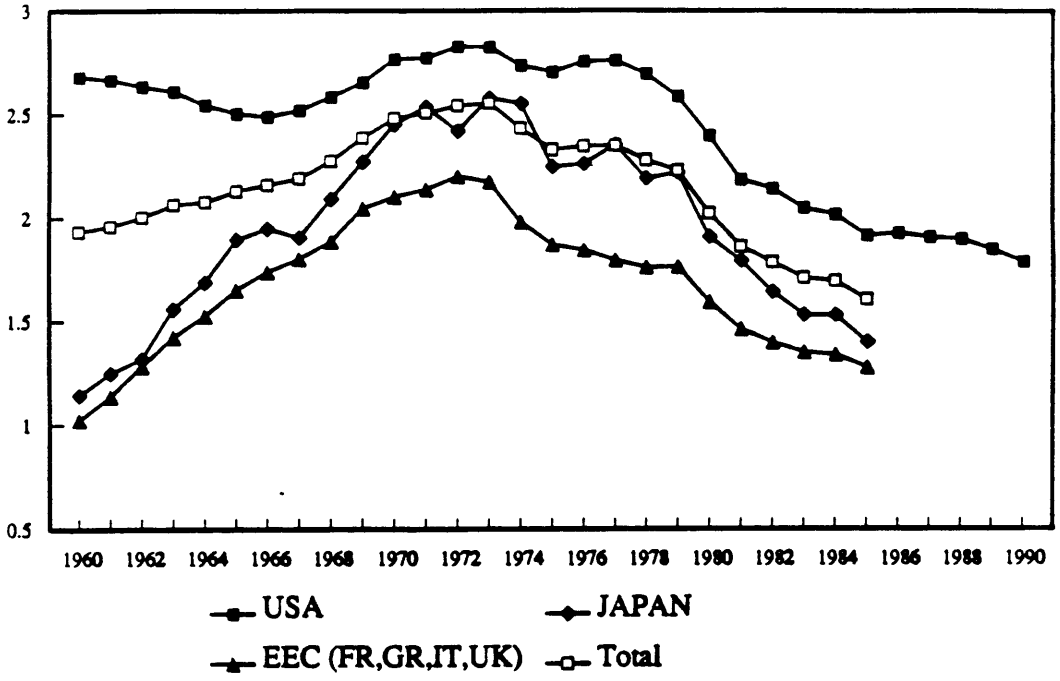


Figure 3. Energy-Income Ratio Shifts

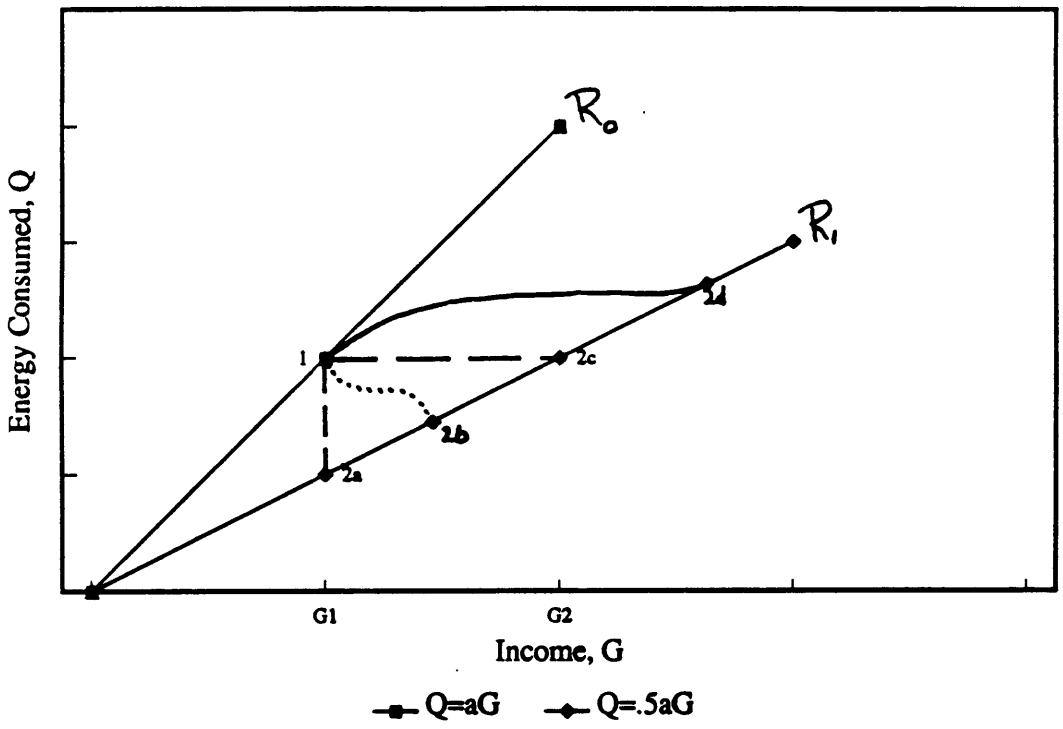
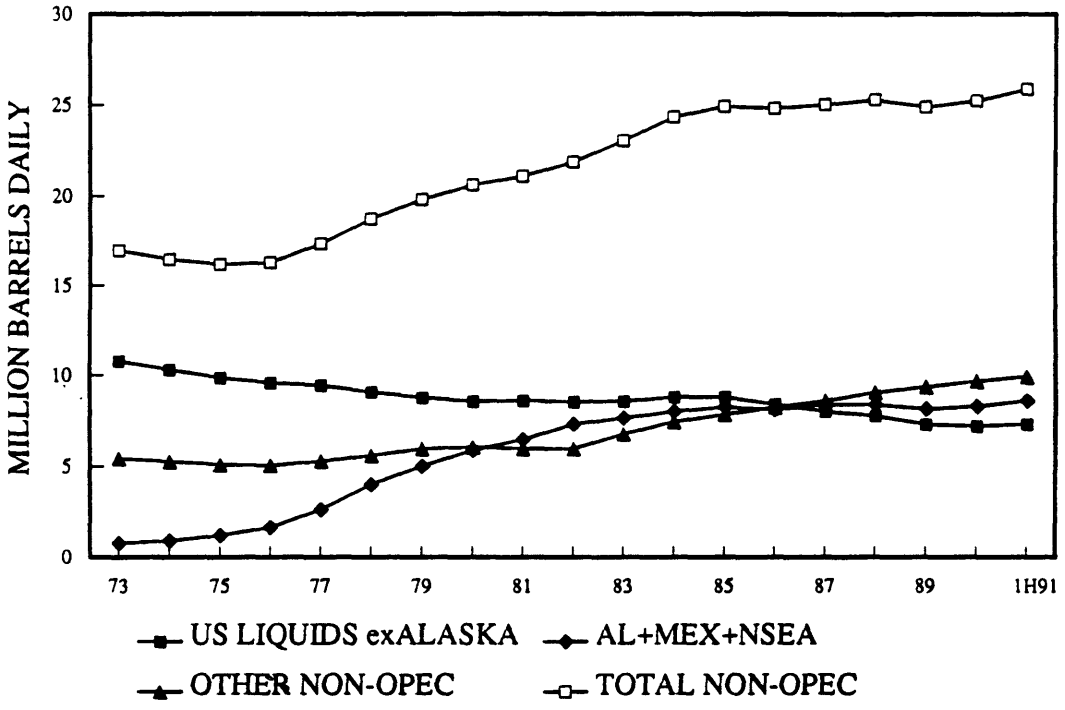
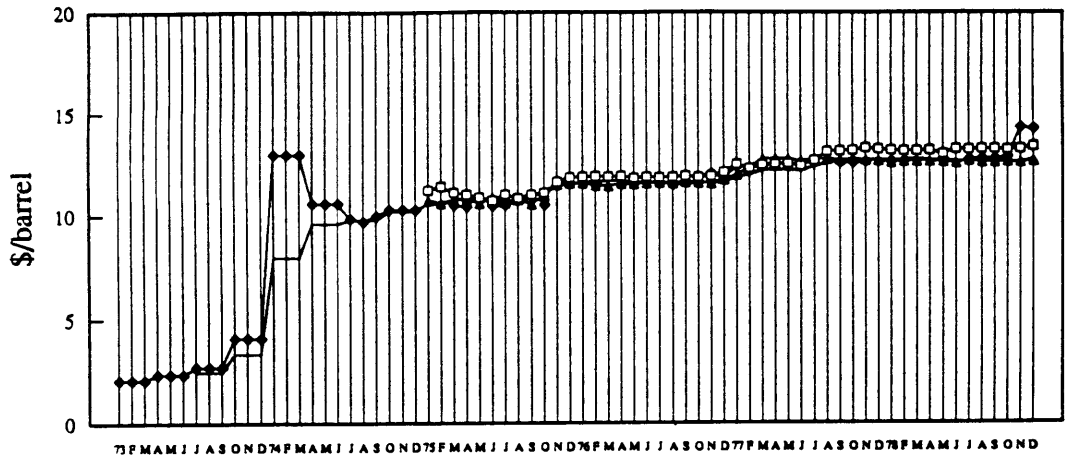


Figure 4. Non-OPEC, Non-Communist Output 1973-1991



Figures 4a-4c. Crude Oil Prices, 1973-1990

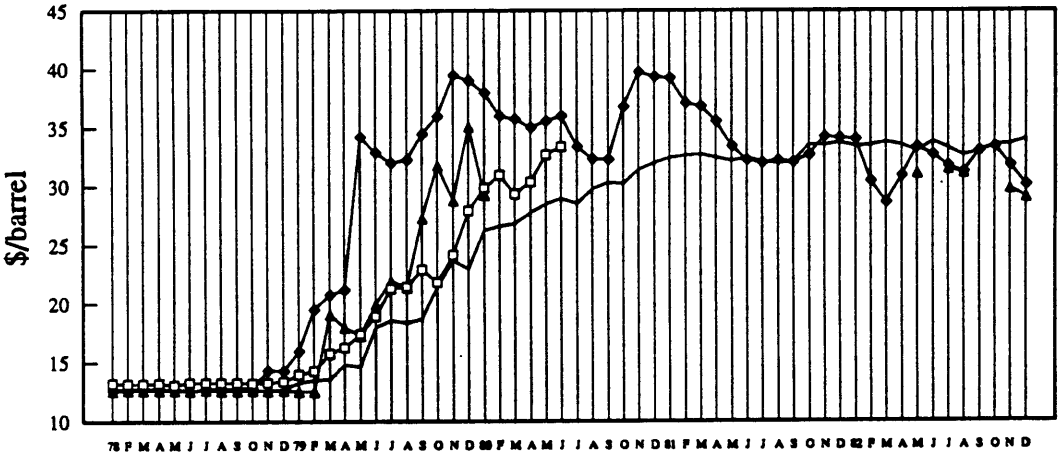
1973-1978



Saudi Export Saudi Light Spot

Iran UAE

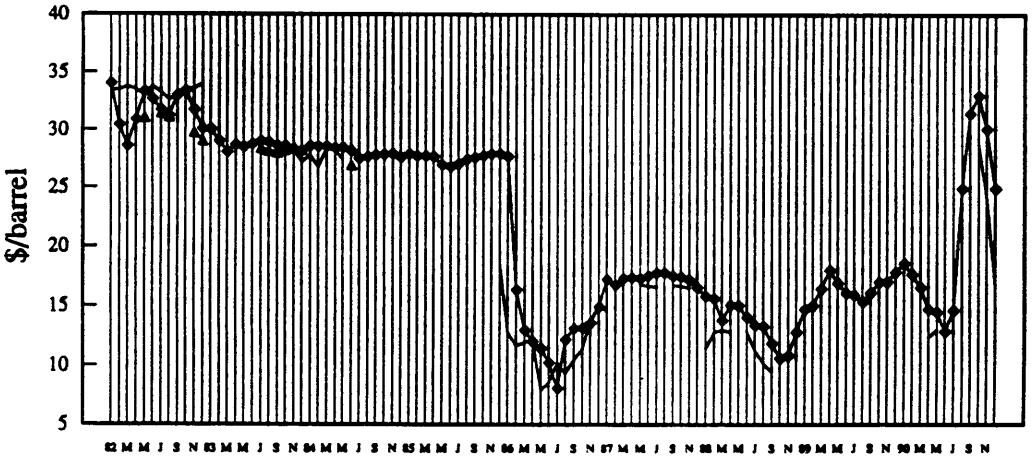
1978-1982



Saudi Export Saudi Light Spot

Iran UAE

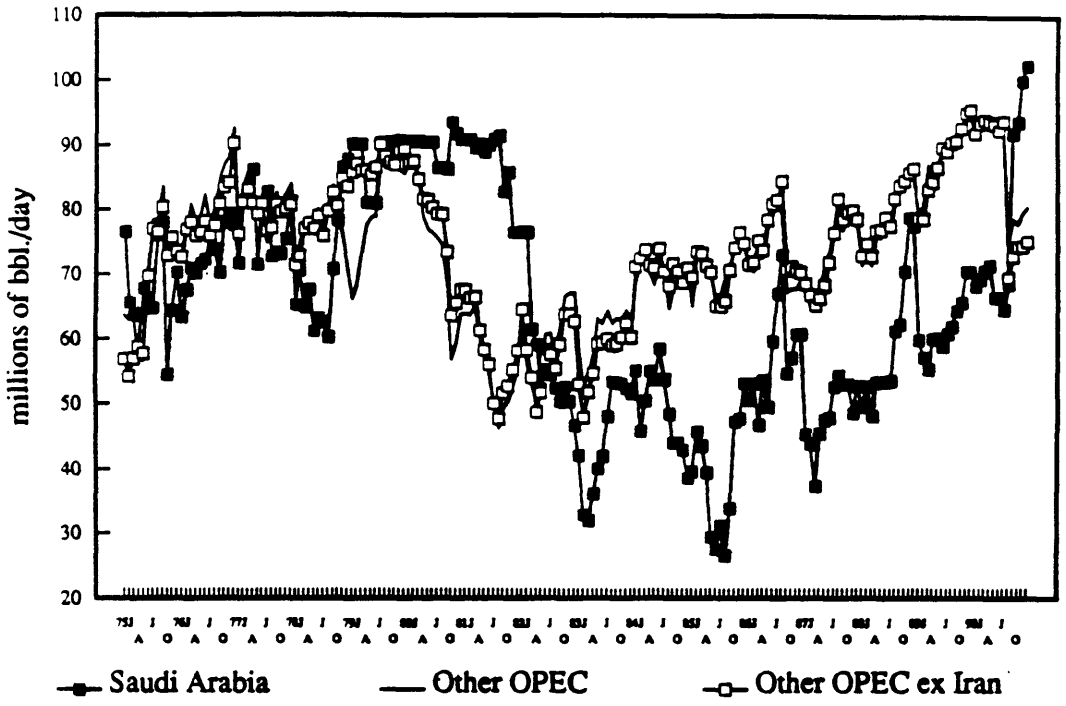
1982-1990



Saudi Export Saudi Light Spot

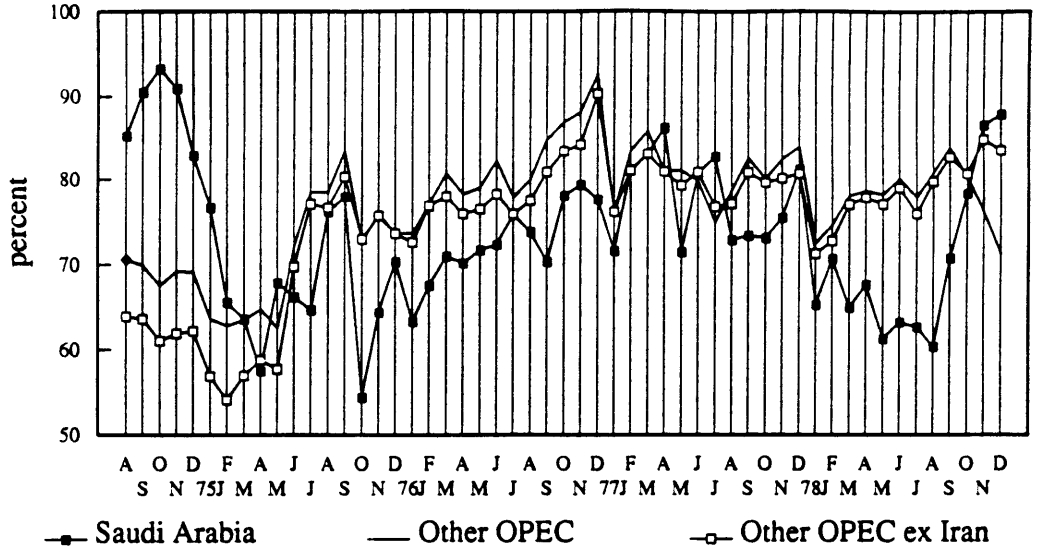
Iran UAE

Figure 5. OPEC Monthly Capacity Utilization, 1975-1990

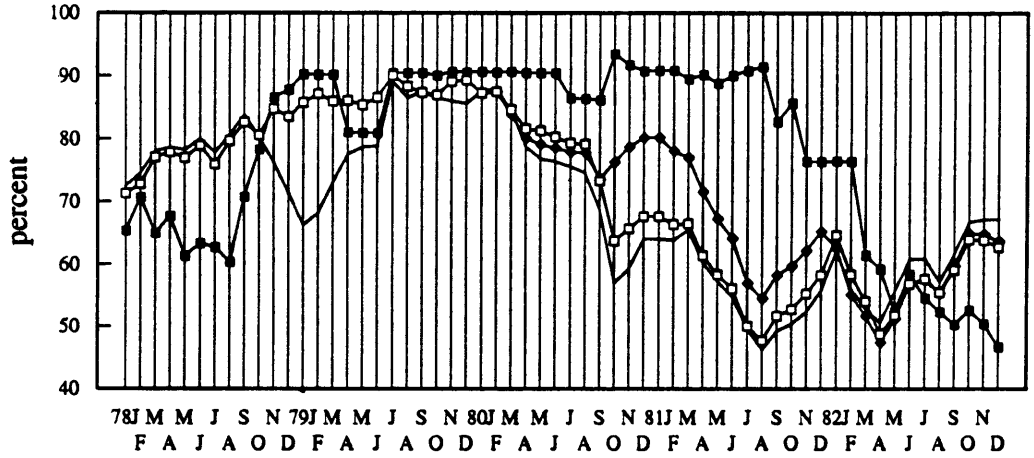


Figures 5a-5c. OPEC Monthly Capacity Utilization

August 1974-1978



1978-1982



1982-1990

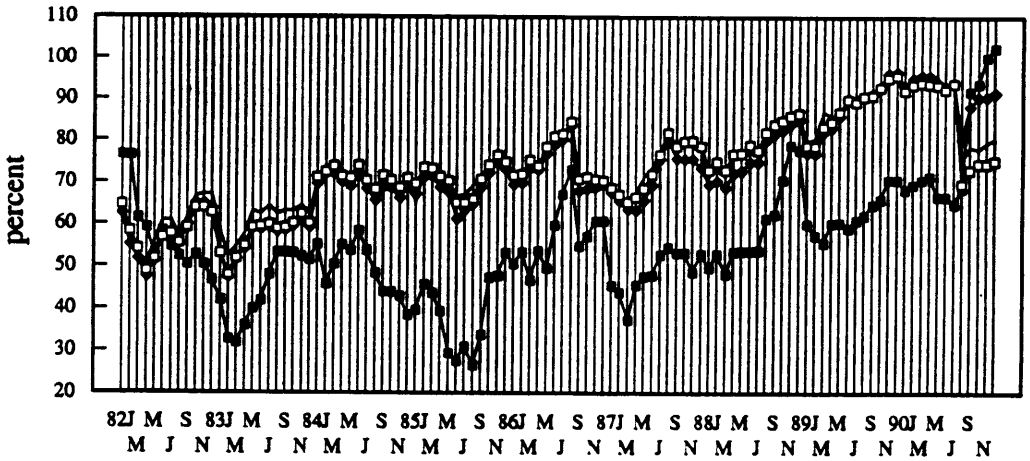


Figure 6. Saudi Arabia Revenues & Expenditures, 1970-1987

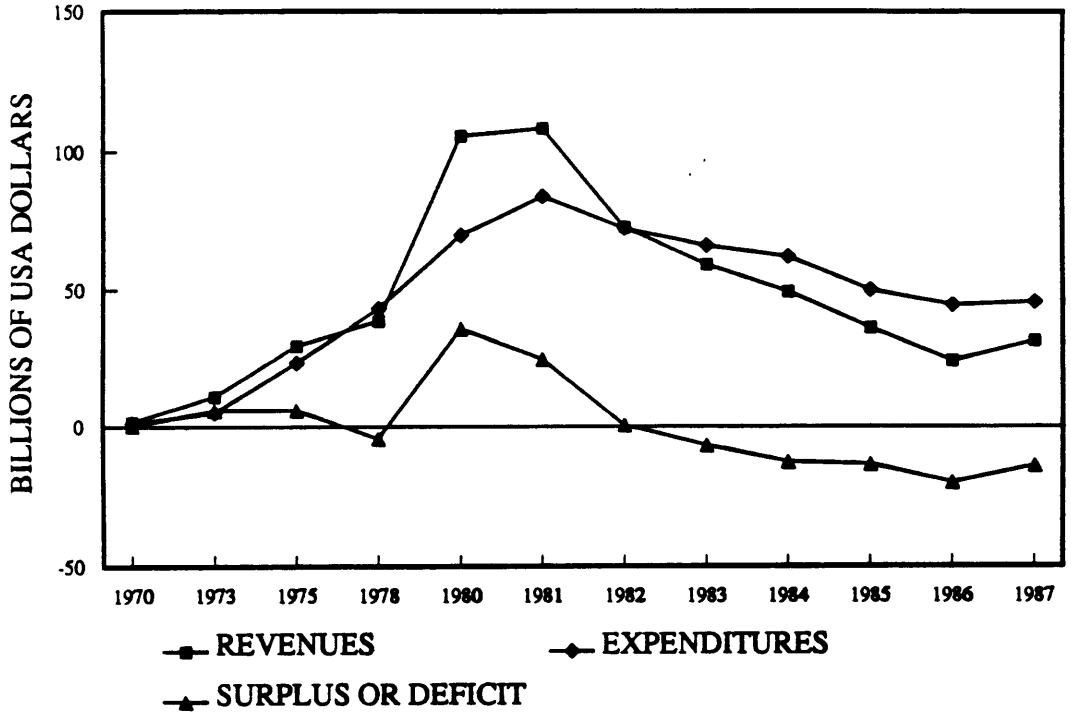
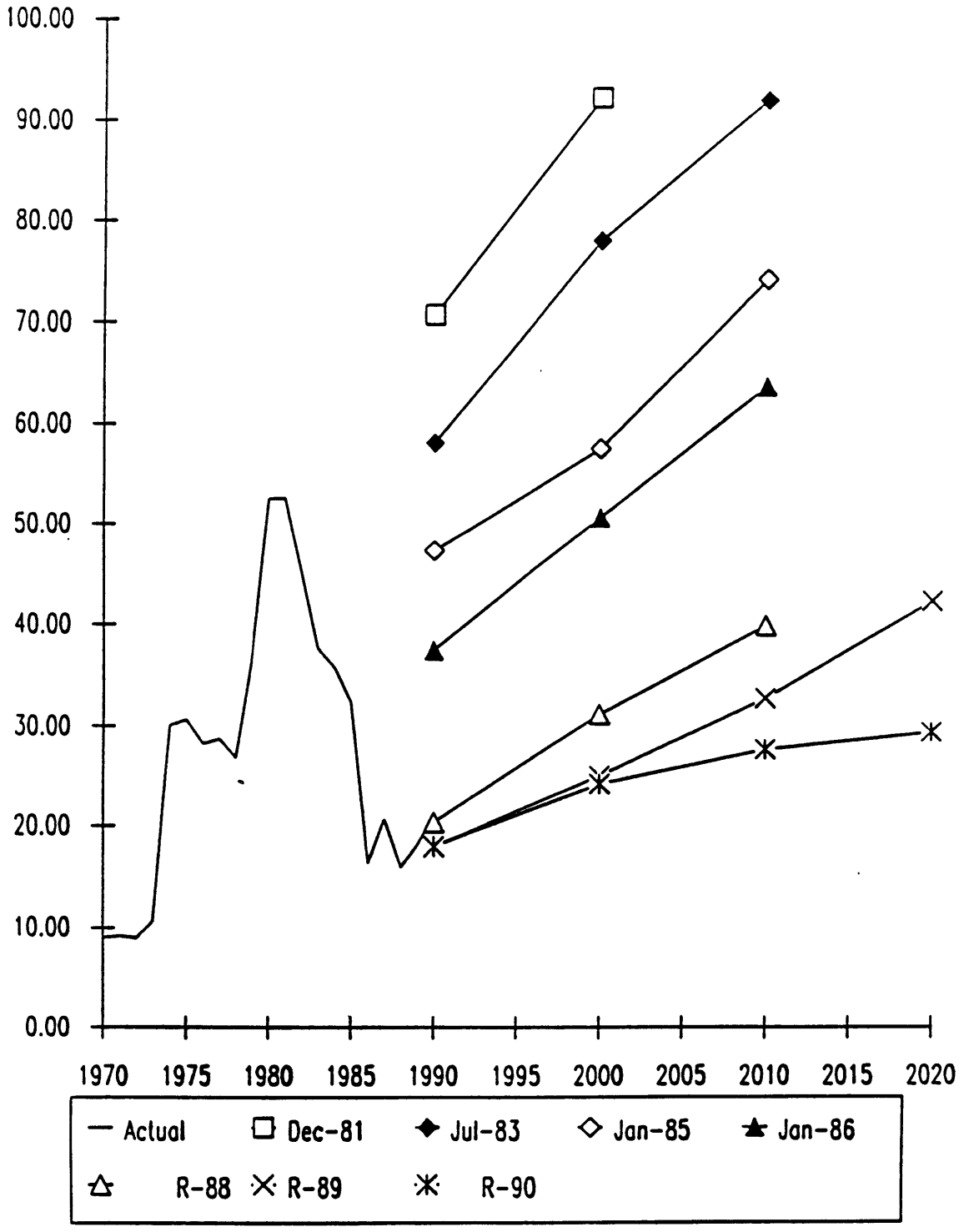


Figure 7. Crude Oil Prices (1990 $/barrel) Actual and Successive IEW Polls



SOURCE: [Manne and Schrattenholzer 1990, p. A2]